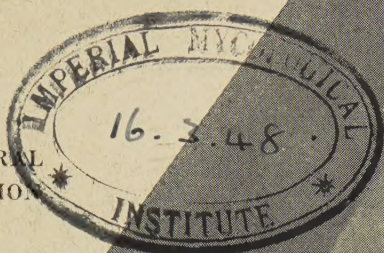


59th

Annual Report

1946



TEXAS AGRICULTURAL
EXPERIMENT STATION

R. D. LEWIS, Director
College Station, Texas



AGRICULTURAL AND MECHANICAL COLLEGE OF TEXAS

GIBB GILCHRIST, President

The Cover Picture

An employee of the Texas Agricultural Experiment Station is shown weighing seed of Texas Rescue 46 grass for shipment to certified seed growers.

Texas Rescue 46 is a strain of Rescue grass selected in 1942 by the Station from several domestic and imported strains supplied for testing by the U. S. Department of Agriculture. It has consistently exhibited a number of desirable characteristics. These are sufficiently superior to other "native" and imported strains to justify making Texas Rescue 46 available to the seed trade. Consequently, foundation seed stocks have been produced and distributed to qualified registered seed growers in Texas. This places the seed where it will be increased at the most rapid rate.

Texas Rescue 46 grass exhibits good seedling vigor and makes an abundance of early growth. It is very leafy and maintains this characteristic throughout the entire growing period. It is resistant to a number of the more common diseases of winter-growing grass plants. It is resistant to leaf and stem rust, mildew and smut. It is consistent in its performance, having exhibited these desirable characteristics throughout the period of observation and testing.

Commercial outlets will have ample certified seed of this grass for planting in the fall of 1948.

Preface

The Texas Agricultural Experiment Station is an extramural branch of the Agricultural and Mechanical College of Texas, and is under the supervision of its board of directors through the College president, the vice president for Agriculture, and the Station director.

Created in 1888 by the Texas Legislature in accepting provisions of the Federal Hatch Act, the Station is composed of 3 main sections embracing 20 functional departments with headquarters at College Station, and 20 substations and 15 field laboratories, which are located in the principal agricultural regions of Texas.

To give the people of the State a panorama of agricultural research as conducted throughout its system, the Station again has selected a representative number of researches to discuss and illustrate for this 1946 annual report.

Experiments omitted are by no means considered any less important than the ones included. The 1944 and 1945 annual reports were similar in general treatment of subject matter; therefore, the current report has been concentrated on research projects which were not portrayed last year, on projects in which additional information has been secured, and on projects initiated during 1946.

CONTENTS

	Page		Page
Amino Acids for Poultry	95	Madrid Sweet Clover for the Blacklands ..	103
Apicultural Research	97	Manganese in Poultry Rations	20
Ascorbic Acid in Dehydrated Vegetables ..	92	Mechanical Harvesting of Corn	21
Ascorbic Acid in Tomatoes	15	Mechanically-stripped Cotton Studies ..	10
Bluestem Meadows in East Texas	98	Mesquite Eradication	31
"Break-even" Volume in Ginning	81	Natural Resistance to Stomach Worms ..	52
Breeding Peaches for a Mild Climate ..	38	New Broccoli Variety	82
Brush Control in Native Pastures	5	New Combine Varieties of Milo	25
Carotene Studies with Fattening Steers ..	56	New Corn Crosses	45
Cattle Adaptability Studies	35	Nitrogen Fertilization on Small Grain ..	42
Chromosomes of Sheep and Goats	18	No Erosion for 20 Years	53
Combine Harvesting of Peanuts	88	Oats in Poult Starter Rations	28
Control of Lemon Stem-end Rot	67	Outlying Stations Serve the Public	100
Control of Weeds in Rice Fields	14	Peaches for the West Cross Timbers ..	100
Cooperating Agencies	105	Peanut Production-cost Studies	19
Corn Hybrids	74	Phosphate Increased Alfalfa Yield	48
Corn Hybrids in the Lower Rio Grande Valley	10	Possibilities for Safflower Production ..	77
Cotton and Corn Fertilizer Tests	83	Possibilities for Soybean Production ..	94
Cotton for Mechanical Harvesting	90	Preface	3
Cover Picture, The	2	Property Taxes and Agriculture	22
Crops Following Grain Sorghum	33	Protecting Tomatoes from Nailhead Rust	70
Crotalaria for East Texas	66	Range Equipment for Turkeys	100
Disease-resistant Potatoes	103	Recovery from Cotton Root Rot	8
Downy Mildew-resistant Cantaloupe ..	58	Rhodes Grass	86
Economic Characters in Cotton	85	Rice Fertilizer Studies	28
Effect of Trash on Grade of Cotton	76	Rice Varietal Work	36
Fattening Lambs in the El Paso Valley ..	91	Roup Takes Heavy Toll	102
Fattening Steers in the El Paso Valley ..	87	Salt Tolerance of Turkey Poults	90
Feather Coloring of Bronze Poults	58	Selling Eggs on Graded Basis	14
Fertilizer Tests in the El Paso Valley ..	67	Skin Folds in Sheep	98
Folic Acid for Poultry	23	Soil Fumigation Increases Tomato Yields	80
Gains of Progeny of Herd Bulls	27	Sorghum Being Developed for South Texas	104
Grazing Special Crops	46	Sprays Useful in Controlling Weeds ..	61
Green Legume Grazing During Winter ..	60	Summer Deferment of Pastures	64
Handy Turkey-catching Chute	43	Superphosphate Versus Rock Phosphate ..	35
Hay and Grain Drying	61	Supplying Phosphorus to Range Cattle ..	71
Holt, A New Fall Peach	76	Tests of Cotton Varieties	50
Hornlessness in Rambouillet Sheep	52	Tomato for Northwest Texas, A	92
How to Handle Kudzu	93	Tomatoes for the West Cross Timbers ..	88
Hubam Clover in the Wichita Valley	34	Tomato Yield Depressed by Ammonia ..	104
Improved Fruiting in Cotton	48	Tracing American Cultivated Cottons ..	16
Improved Pastures in the Gulf Coast Prairie	99	Tryptophane Converted to Niacin	13
Insects of Legumes and Cotton	44	Urinary Calculi in Fattening Steers ..	79
Inspection of Commercial Feed	89	Vegetable Seed Production	11
Kid Quality Mohair on Adult Goats	87	Vitamin C in Turnip Greens	94
Killing Persimmon and Sassafras Sprouts	26	Vitamins in Meat After Stewing	63
Land Price Inflation	18	Volunteer Bur Clover on Crop Land ..	51
Legumes and Phosphate for the Black- lands	30	Weeping Lovegrass	13
Legumes for Soil Improvement	40	Wheat and Native Pasturage Steer Gains	84
Longer Staple Length on Fine Wool Sheep	37	White Grub Problem, The	50
Loose Smut of Wheat	73	Wire and Fence Exposure Tests	78
Lower Rio Grande Valley Cotton	23	Wool-growth Tests	63
		Wool Scouring Plant Activities	80
		Yellow Beard Grass	51

59th Annual Report

1946

TEXAS AGRICULTURAL EXPERIMENT STATION

R. D. LEWIS, Director

Brush Control in Native Pastures

RESearch has achieved some excellent results on improving brush-covered pasture land by controlling the brush, Figures 1, 2 and 3. Texas has 91 million acres of native pasture that is subject to encroachment of trees and woody shrubs. Much of this land is already overrun with these woody plants to the extent that nutritious grasses are almost crowded out and the pasture lands are practically worthless. Many large ranch operators are fighting these noxious plants with various types of heavy machinery drawn by large crawler-type tractors. The costs range from \$15 to \$45 per acre. Because of this high cost of operation and the time required to move this heavy machinery from one place to another, it is not economical to use on smaller farms and ranches.

Through cooperation with commercial machinery companies a farm-tractor mounted power saw has been developed for cutting brush and trees. This saw will successfully cut brush up to 3 inches in diameter while being driven forward. Larger trees are rapidly cut from a standing position. A skilled operator can cut heavy brush at the rate of 1 acre per hour. Larger trees require more time. The average cost of the original cutting of heavily covered brush land will run from \$3 to \$4 per acre. Because of the relatively small invested capital and the low operating cost, these machines are well adapted to use on small farms and ranches.

Regardless of the method in getting brush and trees down, a maintenance problem follows. Brush sprouts and seedlings grow up on the land immediately and, unless controlled, will soon re-cover most of the grazing area.

The tractor mounted saw has been used successfully for this maintenance work. A skilled operator can cut 2 acres per hour. Rolling blade cutters and heavy duty mowing machines have also been used for this work.

It has been found that brush left on the land following cutting will deteriorate rapidly. Within 2 years' time most of it will have returned to the soil as organic matter. Larger tree trunks should be removed to allow maintenance operations.

Most of the grasses have practically disappeared from heavily covered brush pastures. These grasses return very rapidly when the brush competition is removed.

At the Beeville station, a heavily infested pasture was cut with the power saw in March 1942. At that time, very little grass grew on the land. All brush remained on the pasture as it fell. In April 1943, sprouts were re-cut with the saw. No interference was had from the old brush. No further maintenance work has been done on the pasture. It has been heavily grazed most of the time. In December 1946, this pasture was well sodded with nutritious grasses and has a carrying capacity several times greater than it had when the work was started.

Chemicals are now being studied for use in controlling the come-back brush. Sodium arsenite applied under ideal atmospheric conditions has given 75 to 100 percent kill at a reasonable cost. It is a deadly poison and must be used with extreme caution. Ammonium sulfamate gave a 60 to 90 percent kill when atmospheric humidity was above 60 percent. Its economical use is restricted by the high cost of materials. Kerosene and other coal oil products have been used successfully when a complete coverage of the root crown of the tree was secured.

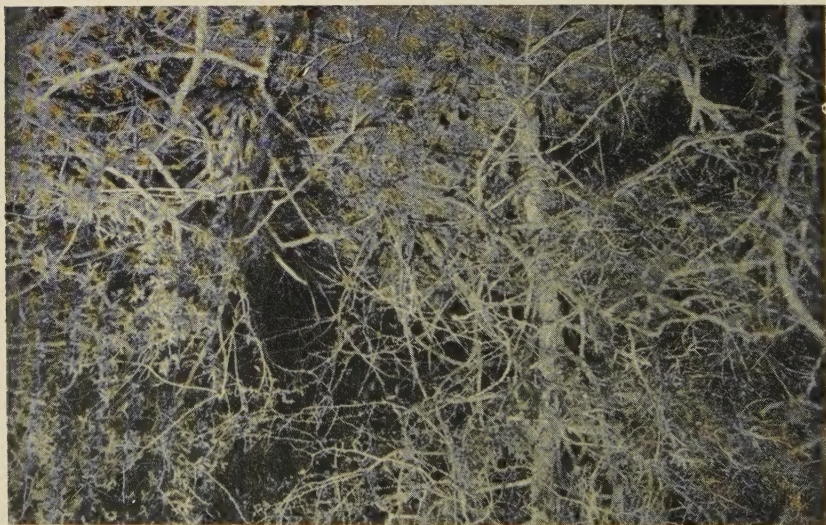


Figure 1. Thick brush showing bare ground under the brush. No grass. Contrast with Figure 3.

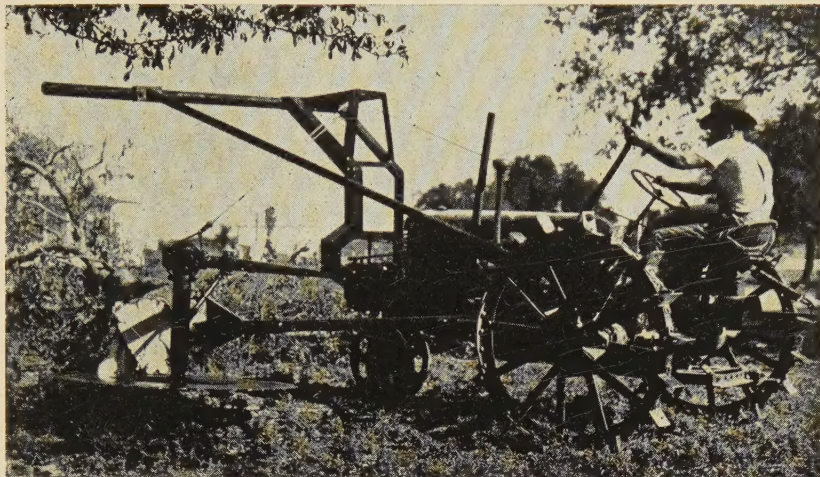


Figure 2. Tractor-mounted power saw used to clear pastures of brush. The 60-inch circular saw can cut small brush up to three or four inches in diameter without stopping. Large trees can be felled by driving up to the tree and feeding the saw into the tree by hand.

Another class of chemicals known as hormones, in which 2,4-D is the active ingredient, is now being tried extensively. Results to date indicate that these chemicals are effective on the soft, porous-fibered plants such as the wild rose. Little effect is shown on the hard, close-fibered species like the common black brush. These studies are being continued.



Figure 3. Right—Virgin brush. Left—Cut with saw in March 1942. Re-cut with saw in 1943. Note grass coverage among 3½ years' growth of brush sprouts.

Recovery from Cotton Root Rot

Not all the cotton plants attacked by the fungus *Phymatotrichum omnivorum*, the causal organism of cotton root rot, die from the disease. It can be shown in many cases that apparently healthy plants in the field have been attacked by the fungus and have survived the attack. This survival is usually accompanied by the development of callus tissue in the region of the lesion caused by the fungus and by the enlargement of lateral roots arising above the infected parts.

An experiment was performed by the Station to reveal the relationship between the ability of cotton roots to form effective calluses after mechanical amputation of the main or tap root, and after being attacked by the root-rot fungus. The experimental plants were of six different physiological types.

Three experimental treatments were employed to vary the carbohydrate levels: high carbohydrate level, produced by removal of all lateral buds; intermediate carbohydrate level, obtained by permitting normal fruiting and growth, and low carbohydrate level, produced by fruiting and by removing half of each leaf blade. Half of the plants in each of these three classes were supplied with a low or limited supply of nitrogen, while the other half received a high or abundant supply of inorganic nitrogen.

These experimental treatments resulted in 6 distinctly different

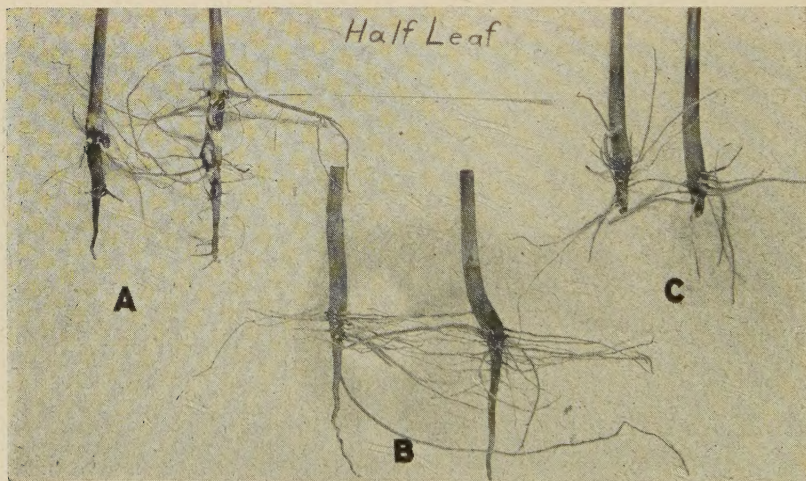


Figure 4. Low nitrogen—low carbohydrate cotton roots. A. Roots showing delayed recovery from root rot following almost complete destruction of root system. B. Normal, healthy control roots. C. Roots showing poor callus development following amputation of lower portion of the tap root.

types of cotton plants when judged by the usual standards of growth, or boll loads, which they supported. Increasing either the nitrogen or the carbohydrate level caused increased growth and fruiting.

When the plants had entered into the fruiting phase of growth, they were either saved as normal controls, inoculated with root rot, or had their tap roots completely severed three inches below the soil line by the use of bone snips. The plants were then allowed to continue their development under the experimental treatments. Final data were taken on boll load, callusing, and reaction to the root rot inoculations.

These data show that the nutritional factors favoring increased growth and fruiting have equally favorable effects on callus development, enlargement of the lateral root system, and on recovery from attack by the root rot fungus. The amount of fruiting and the rate of callusing are increased while the mortality from root rot is decreased by the factors favoring adequate accumulation and storage of reserves in the vegetative tissues. These same reserves may apparently be used in fruiting, growth, or in callusing; and they likewise increase the probability that the plant will survive if attacked by root rot. See Figures 4 and 5.

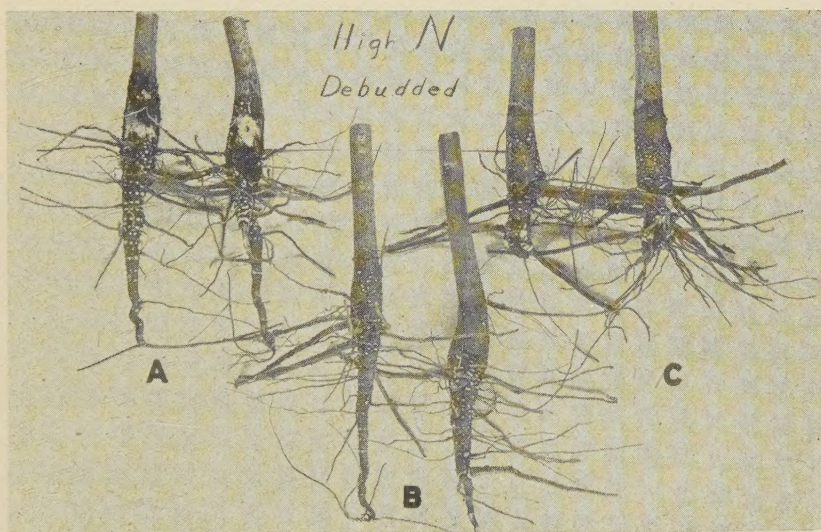


Figure 5. High nitrogen—high carbohydrate cotton roots. A. Roots showing complete recovery from attack by root rot. The development of wound tissue has healed over the old cankers. B. Normal, healthy control roots. C. Roots showing excellent development of callus tissue and enlargement of the lateral root system following amputation of lower portion of the tap root.

Corn Hybrids in the Lower Rio Grande Valley

Thick stands (9 x 36-inch spacing) at the Weslaco station along with adequate irrigation gave 100 percent higher yields of corn hybrids than the Hidalgo County average, where the better hybrids were used.

Tuxpan x (4R₃x61M) gave yields near 100 bushels per acre, and most of the combinations of (KYSx203) with Yellow Tuxpan and with the better single crosses gave grain yields ranging above 100 bushels per acre.

Mechanically-stripped Cotton Studies

In a comparison between two identical power-driven strippers, one with and one without an extractor unit, no difference in grade or staple of cotton was obtained at the Lubbock station in paired bales.

One bale from each machine was taken to four gins, each of which had a different make of cleaning equipment. Apparently the cleaning equipment was comparable, although the classers' staple length varied from 7/8 to 15/16 inch between gins for the same variety of cotton.

Results during 1946 indicate that the main difference between stripper units equipped with and without an extractor is in tonnage carried to the gin and in the benefit to be derived from burs put back on the soil.



Figure 6. Showing the amount of leaf and other trash eliminated by cotton stripper unit and cross conveyor screens.

The stripper unit mounted with an extractor removed an average of 65 percent as many burs as a stationary Mitchell extractor. Considerable difference was noted between varieties tested with the mounted unit, ranging from 58 to 71.4 percent burs extracted. One of the stormproof strains had the highest percentage removed.

The importance of the stripper unit and side conveyor screens was accentuated during the 1946 season by the heavy second growth of leaves after defoliation and by the rapid plant deterioration after frost. Tests indicated that these units eliminated dried leaf and dirt trash at the rate of 228 pounds per acre. Leaf and removable trash constituted 11.6 percent of the total plant weight this season at harvest time. See Figure 6.

Field losses in cotton harvesting can be increased from 2 to 3 percent up to 8 to 12 percent depending on the driver. See Figure 7.

An early maturing prolific stormproof $\frac{7}{8}$ inch staple cotton selected from a cross of Macha and Acala will be increased in 1947. Because of its somewhat determinate fruiting habit, this cotton should be fully mature and ready for mechanical stripping before plant deterioration begins. Plant deterioration usually comes about three weeks after frost and results in lower grades.



Figure 7. Showing cotton losses encountered by the failure of the driver to stay on the row.

Vegetable Seed Production

Onion, carrot and table beet seeds have been grown successfully on a limited scale at the Ysleta station in the El Paso Valley. See Figure 8. All of these crops, though normally biennial, can be produced in one year by planting the seeds early in September

and harvesting the seed crop early in July. The normal rainfall during the growing season amounts to less than one-half inch each month. Climatic conditions appear to favor the production of these and possibly other vegetable seeds.

Onion seeds have been produced at the Ysleta station since 1942. In spacing experiments it has been found that closer spacing results in higher yield per acre but lower yields per bulb. The yield was only slightly reduced when the mother bulbs were placed on the side as compared with upright. Turning the rootplate up resulted in low yield and poor stand. Bulbs, which had already produced 1 seed crop, gave a fair yield, apparently depending on condition of bulbs and stand obtained. Replanting old mother bulbs may be profitable when seeds are high and onions scarce. Yields ranging from 150 to 650 pounds per acre have been obtained, depending on variety and weather conditions.

Onion breeding work at the Winter Haven station in the Winter Garden area has resulted in improved varieties for South Texas. The bulb crop is grown at Winter Haven and sent to the Ysleta station for seed increase. This permits breeding and selection for their particular climatic conditions with the result that higher yielding, higher grading, and earlier onions are available for South Texas.



Figure 8. Onion seed crop growing at the Ysleta station in the El Paso Valley.

Tryptophane Converted to Niacin

The interrelationship of amino acids and vitamins has been demonstrated by recent Station investigations. Working with two unrelated species of animals it has been shown that the amino acid, tryptophane, can be converted in the body to niacin, the B vitamin which prevents pellagra in humans, and is also a dietary essential necessary for pigs, dogs and poultry.

The experimental animals used were Shetland ponies and cotton rats. When these animals were fed extra amounts of tryptophane there was an increase of more than 300 percent in the amount of niacin or related compounds excreted in the urine.

These experiments explain, at least in part, the high incidence of pellagra among people whose diets are low in protein. The amino acid, tryptophane, is present in most proteins. Thus, when the amount of protein in the diet is low there is very little tryptophane for the manufacture of niacin.

Weeping Lovegrass

Weeping lovegrass (*Eragrostis curvula*) is a native of South and East Africa and was first introduced into the United States by the U. S. Department of Agriculture in 1928.

It is adapted to a wide range of soil and climatic conditions; it is winter hardy under normal conditions throughout Texas and will grow in areas of 15 inches of rainfall, provided 7-9 inches come during the summer months; it will grow on soils from coarse sand to heavy silts and clays ranging from a high to low fertility level.

Weeping lovegrass has its greatest use in soil conservation. It will grow in many sites where other grasses fail. Under most conditions it produces abundant vegetative cover as well as a deep, tenacious root system. It has proven to be a valuable forage plant in certain areas of the State, especially in the West Cross Timbers and on the High Plains. Where it is used for pasture some method of controlled grazing must be practiced. When the plant is young and tender it is readily eaten, but as it approaches maturity it is often rejected.

Weeping lovegrass has a definite place in Texas agriculture, but we do not know all areas of adaptation nor to what extent it will fit into a forage program.

Control of Weeds in Rice Fields

Control of rice field weeds by 2,4-D was secured in 1945 and 1946 by the Beaumont station. The material was applied by plane at the rate of 10 to 15 pounds per acre of 10 and 5 percent dusts respectively, and aqueous sprays of 2 gallons of 7.5 percent concentration per acre. Small areas of fields can be treated with hand sprayers of 3 to 5 gallon capacity, or by hand dusters.

The weeds most abundant in rice fields, and most damaging to the rice crop are the tall indigo (*Sesbania exaltata*), curly indigo (*Aeschynomene virginica*), Mexican weed (*Cyperonia palustris*), and the spearhead sedges (*Rynchospora corniculata* and *R. macrostachys*). There are some 25 to 30 other weeds that may at times be found in sufficient numbers to be detrimental, but most of these weeds are easily killed if 2,4-D is properly used.

Reduction in grade because of the weed seeds present in rice, expense of hand cutting of weeds, reduction in yield because of competition of the weeds for soil nutrients, and reduction in land value because of weed contamination combine to cause considerable loss in rice production.

Some of the weeds can be controlled by the proper use of irrigation water in the field proper. Most of the so-called broad-leaved plants fall into this group. However, these weeds also grow on the levees. It is here that the 2,4-D type of weed killer promises to be very effective. The control of these weeds eliminates the seed source that serves to infest the remainder of the field.

The cost of treatment in 1946 was about \$1.00 more per acre than for hand cutting. But, in addition to the tall and curly indigo, which are all that are ordinarily cut out, the farmer also had the other broad-leaved plants and the sedges killed.

No injury to the rice has been observed through the use of the dusts or aqueous sprays when they were applied according to the instructions that came with the materials. One precaution must be observed. Do not use any of these materials when the rice is "in the boot," or when it is flowering. The seed will not germinate if these materials are used at such a time that they are taken into the seed as it develops.

Selling Eggs on Graded Basis

Most eggs in Texas are sold as current receipts, but in isolated instances they are sold on a graded basis. Evidence indicates that the farmer whose eggs are purchased on a graded basis delivers a

better product to the buyer. This statement is borne out by an analysis made by the Station of the operations of an egg buyer purchasing from producers on a graded basis. Over 500 producers made sales to this buyer during the period under study. This buyer began an egg grading program based on the U. S. Consumer grades on Oct. 1, 1946, following 2 months of a limited grading program. During October, 1945, only 61 percent of the eggs delivered to him were of top quality, whereas during the heat of the following June, 75 percent of all eggs delivered met Grade A requirements. The high point was reached in April with 84 percent Grade A.

The number of loss eggs (leakers included) delivered to the buyer dropped to less than 1 percent during the third month of the program, and did not again exceed 1 percent of the total delivered by the producers. During July, 1946, for example, less than 0.75 percent of all eggs delivered were inedible or broken.

The extra return to the producer per dozen eggs, considering all eggs delivered, varied with the season. During the spring flush the producers averaged only a little over 30 cents per case above current receipt prices, but during the fall (October and November) they averaged \$5 to \$6 more per case.

Ascorbic Acid in Tomatoes

A study was made by the Station of the effect of fertilizer treatments on the ascorbic acid content of Rutgers tomatoes grown at the Tomato Investigations Laboratory at New Baden.

The treatments under consideration were: no fertilizer, complete fertilizer (6-12-6), no nitrogen (0-12-6), no phosphate (6-0-6), no potash (6-12-0), and no nitrogen or potash (0-12-0). The fertilizer was applied on a basis of 600 pounds of 6-12-6 per acre before setting the plants. A comparative study was also made between fruits from complete fertilizer plats which were shaded by the vine and those which were unshaded.

The ascorbic acid content of all treatments tended to increase from the first picking on June 27 until July 16. After the latter date, fruit from plats receiving no fertilizer and also no nitrogen showed a slight decrease in ascorbic acid content, and those from plats receiving no phosphorus showed a considerable decrease. Fruit from plants receiving a complete fertilizer, no potassium, and phosphorus only, showed slight increases.

The average seasonal ascorbic acid content was the highest on plats to which phosphorus only had been added, and this was closely followed by that from the no-fertilizer plats. The lowest seasonal

average was on the complete fertilizer plats. The difference between the two highest and the lowest was about 4.5 milligrams per 100 grams of ascorbic acid. The two treatments with the highest amount of ascorbic acid had a smaller amount of vine growth than was considered normal. The amount of vine growth on the complete fertilizer plats which had the lowest ascorbic acid content was considered normal.

Tomato fruits which were not well shaded by the vines on the complete fertilizer plats averaged 4.5 mg./100 g. of ascorbic acid higher than those which were well shaded.

The data indicate that fertilizer treatment, as it affects vine growth and thus the amount of light which the fruit receives, may be an important factor in determining the ascorbic acid content of tomatoes.

Tracing American Cultivated Cottons

The known species of cotton fall into two main groups on the basis of chromosome number, one group having 13 pairs of chromosomes, the other, 26 pairs. The American cultivated varieties, including the upland types, have 26 pairs and are considered amphidiploids; that is, genetic evidence supports the view that they originated in early times from two diploid species, each having the base number or 13 pairs of chromosomes.

As part of the Station's cotton breeding program, many different species of cotton have been crossed in order to produce new types.



Figure 9. Left: Blossom and five-lobed leaf of a wild African species of cotton, *Gossypium anomalum*. Right: Blossom and entire leaf of *G. davidsonii*, a wild American species from Mexico.

The sterile hybrids which result from crossing two distantly related species are generally treated with colchicine in order to double the chromosome number and so make the plants fertile.

In several instances such treatment has not been necessary, as in the case of a hybrid which was produced by crossing a wild African species (*Gossypium anomalum*) with a wild American species (*G. davidsonii*). See Figures 9 and 10. One such hybrid plant produced a fertile boll containing viable seeds which on planting gave rise to a new fertile strain. Counts of the chromosome number showed the new type to have 26 pairs, hence to be amphidiploid. The hybrid strain, which combines the characteristics of the two parental species to an intermediate degree, is virtually a new species. As such, its spontaneous origin throws additional light on the probable mode of origin of the American cultivated varieties.

The new amphidiploid is only one of several which have been produced by the Station and which are being used in crosses with upland cotton. A similar hybrid, produced earlier under laboratory conditions from an American wild and a cultivated Asiatic species, has been used extensively to produce strains from which lines having additional fiber strength are being selected. The technique of crossing such hybrids with American uplands represents one means by which desirable economic character from wild species of cotton can be introduced into our cultivated varieties.



Figure 10. Left: Blossom of sterile first cross hybrid of *Gossypium davidsonii* and *G. anomalum*. Right: Blossom of fertile second cross hybrid. Note difference in size. Leaves of hybrid plants are three-five lobed, intermediate in shape and color between those of the 2 parental species.

Land Price Inflation

Farm and ranch land prices rose sharply under the pressure of war and postwar increases in agricultural commodity prices, a Station study revealed. By 1946 the State index of land prices was nearly double the 1935-39 average. In some areas the average consideration per acre reached a record figure.

For the most part, land prices tended to lag about 12 to 18 months behind commodity prices. For example, in the Western Cross Timbers where peanuts represent the dominant cash crop, peanuts sold in 1932 at the lowest price in a 26-year period, Figure 11. It was 1934 before land prices hit bottom. Both indexes show a steady recovery since, but land has not yet caught up with its main income-producing crop.

Despite the general increases in land prices, most buyers have not forgotten the hard lessons learned in the years following World War I. As a consequence, many of the usual characteristics of a land boom do not exist in Texas. The rate of resales is low in most areas. Straight cash transactions have been the rule. Mortgage indebtedness, as a percentage of total farm real estate values, has gone down instead of climbing.

Land ownership generally is characterized by a relatively solid investment base, and is not likely to be seriously jeopardized by receding commodity prices.

Chromosomes of Sheep and Goats

Sheep of all species which belong to the genus *Ovis* may be crossed and will produce fertile offspring. Some if not all of these species have been separate since prehistoric ages. The Bighorn (*Ovis canadensis*) and the sub-species of this genus have been separated by geographic barriers from all the other groups of wild species and domestic sheep until recently. However, the Bighorn, insofar as it has been tried, produces fertile hybrids with other sheep in the genus *Ovis*.

Since the chromosomes are the basic elements which are concerned in heredity and fertility of animals, a study has been made by the Station to find out how much similarity there is in the chromosome picture of representative species. The Bighorn (*Ovis canadensis* Nelsonii), the mouflon, (*Ovis musimon*), and the domestic sheep (*Ovis aries*) have a diploid number of 54 chromosomes. Also, the chromosomes of the three species are similar in morphology, as all have 6 large V-shaped chromosomes, which seem to be characteristic

for this genus. Another species (*Ammotragus lervia*), usually called sheep, but classified as a separate genus, was found to have 58 chromosomes including 2 large V-shaped ones. This species was found to be infertile with domestic sheep, but fertile (stillborn young) with domestic goats (*Capra hircus*).

Domestic goats were found to have a diploid number of 60 chromosomes, none of which was large and V-shaped. When domestic goats were mated to domestic rams, fertility occurred, but the embryo invariably died before the end of the normal gestation period.

Another species of goat (*Hemitragus jemlahicus*) was studied cytologically and found to have 48 chromosomes, the smallest number for any species of this sub-family studied. When this species was crossed with domestic female goats, fertility occurred, but the fetus died before birth. In all these crosses, where there was a difference in chromosome number, there was incomplete fertility (either non-fertility or stillborn or aborted fetus).

From the cytological standpoint the true sheep, *Ovis*, are constant in regard to chromosome number and morphology. It is remarkable that there have been no visible chromosome changes during the long period of separation among the species of this genus. The Aoudad or Barbary sheep (*Ammotragus lervia*) and the tahr goat (*Hemitragus jemlahicus*) are both different in chromosome number and morphology from either the true sheep *Ovis* or the true goats *Capra*. This rather striking difference in the chromosome complement of these species makes the production of living offspring by intergeneric hybridization very unlikely, thereby virtually eliminating the possibility of transferring desirable characters from one of these groups to the other.

Peanut Production-cost Studies

Costs of producing peanuts increased sharply in the West Cross Timbers between 1941 and 1945. Based on a normal yield of 502 pounds per acre and 1941 prices for cost items, the computed cost of producing peanuts was 64 cents per bushel on a representative group of farms using two-row tractor equipment, Figure 11. The cost increased to 98 cents per bushel when 1945 prices for cost items were substituted for 1941 prices. In the case of those farms using one-row, horse-drawn machinery, the increase in cost was from 87 cents to \$1.40.

During this period (1941-1945) land prices in the area doubled

while the cost of seed more than tripled. The cost of most other items increased 25 to 60 percent.

In view of the rapid trend toward mechanization in peanut production, the relatively lower costs with motorized equipment as compared with horse-drawn equipment is significant. Harvesting remains as the last hurdle to complete mechanization. There are indications that this hurdle may also be removed within the near future.

The above costs are based on data obtained by the Station in a detailed farm management study on typical farms in the West Cross Timbers, the principal peanut-producing area west of the Mississippi River.

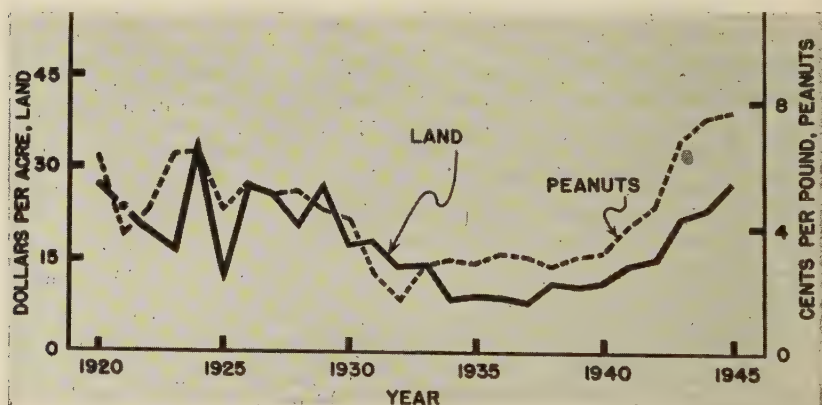


Figure 11. Price received by farmers for peanuts and average price of land in Erath county, Texas, 1920-1945. *Data for 1921 not available.

Manganese in Poultry Rations

The importance of manganese to poultry laying stock was emphasized as a result of studies conducted by the Station. Various amounts were fed, and it was determined that 0.25 pound of manganese sulfate per ton of mixed feed is sufficient to meet the manganese requirements of laying stock.

When manganese sulfate was added to an all-mash formula and fed to second-year hens, there was a 39 percent increase in their egg production. Egg production of pullets was not increased by feeding the mineral. Both fertility and hatchability of hens and pullets were improved about 15 percent by feeding manganese sulfate to hens and pullets; the improvement was slightly but not significantly greater in the hens than it was in the pullets. It was

also found that less vitamin D was required for hens and pullets when manganese sulfate was added to the feed.

Egg production, fertility, hatchability and eggshell quality were improved by adding manganese to an all-mash ration. The results indicated that it was more important to have added manganese in the feed of hens that are starting the second year of production than it was to add this mineral to the feed of pullets.

Mechanical Harvesting of Corn

Texas corn growers have been slow to use the mechanical corn picker for several reasons. Because of war conditions machines could not be obtained; farmers prefer to harvest their corn with shuck on ear; the commonly grown open-pollinated varieties are not well suited to mechanical harvesting, and the general practice is to harvest corn late, after the cotton crop is harvested, when a mechanical corn picker would cause excessive field losses.

The Station began a study in 1942 to determine the harvesting characteristics and efficiency of the conventional type corn picker under Texas condition, and to determine the relation of plant characteristics of corn to mechanical harvesting. Two popular open-pollinated varieties, Yellow Dent and White Surcropper, and two hybrids, Nos. 8 and 12, were selected for study.

Data have been obtained on a number of plant characteristics and their apparent effect on field losses with harvesting done in



Figure 12. Showing how stalks of Surcropper broke off and collected on the machine when harvest was delayed until October.



Figure 13. Stalks of Hybrid No. 8 did not break off and collect on the machine, as did Surcropper, Figure 12, at the October harvest.

August, September and October. This study showed that as the date of harvest becomes later there is a corresponding increase in field losses. See Figures 12 and 13. This is almost entirely for ear corn, as the shelled corn losses remained fairly constant for the three dates. There was also a higher percentage of the stalks down and lodged at the October harvest than in August or September. The stalks become progressively dry and brittle and break easily. The ear shanks also become brittle and ears snap off and fall to the ground when the gatherers hit the base of the stalk, thus causing excessive losses in late machine harvesting.

Property Taxes and Agriculture

The general property tax is of considerable importance to Texas agriculture. It is the major support of most public services directly received by rural people: the schools, rural roads, and various other services of county government. The property levy is also a cost factor in agricultural production, and, perhaps with the exception of Federal income taxes during recent years, is the most burdensome tax felt by farm people.

An analysis by the Station of farm and ranch real estate taxes during 1946 revealed the tax per acre of land over the entire State to be 18.2 cents, about the same as for the prior year. Variation is considerable. The lowest average tax per acre was 3.3 cents in

the Trans-Pecos cattle grazing area. Highest amounted to \$1.88 per acre in the Lower Rio Grande Valley area.

Despite improved tax collection during recent years for the State as a whole, tax delinquency is still a major problem in some localities, particularly in counties having pronounced land utilization problems. Based on State taxes, delinquency per county ranged from 0.05 percent to 23.44 percent for 1945. "Unknown" ownership of land was found to be one of the major causes of tax delinquency. The entire delinquent roll of 46 counties, for a recent year studied, consisted of "unknown owners."

Fiscal capacity, measured by assessed valuations of property, varies extremely in relation to needs for both county government and school districts. Assessed values per capita for counties vary from \$254 to \$13,514. For independent school districts, the assessed value per scholastic varies from \$284 to \$78,710.

Folic Acid for Poultry

Recent studies by the Station with folic acid, a vitamin needed by poultry for normal growth, feather and hemoglobin production, indicate that certain diets composed of natural materials may be deficient in this factor. An improvement in growth was obtained in preliminary tests when 2 milligrams of folic acid was added per kilogram (2.2 pounds) of ration.

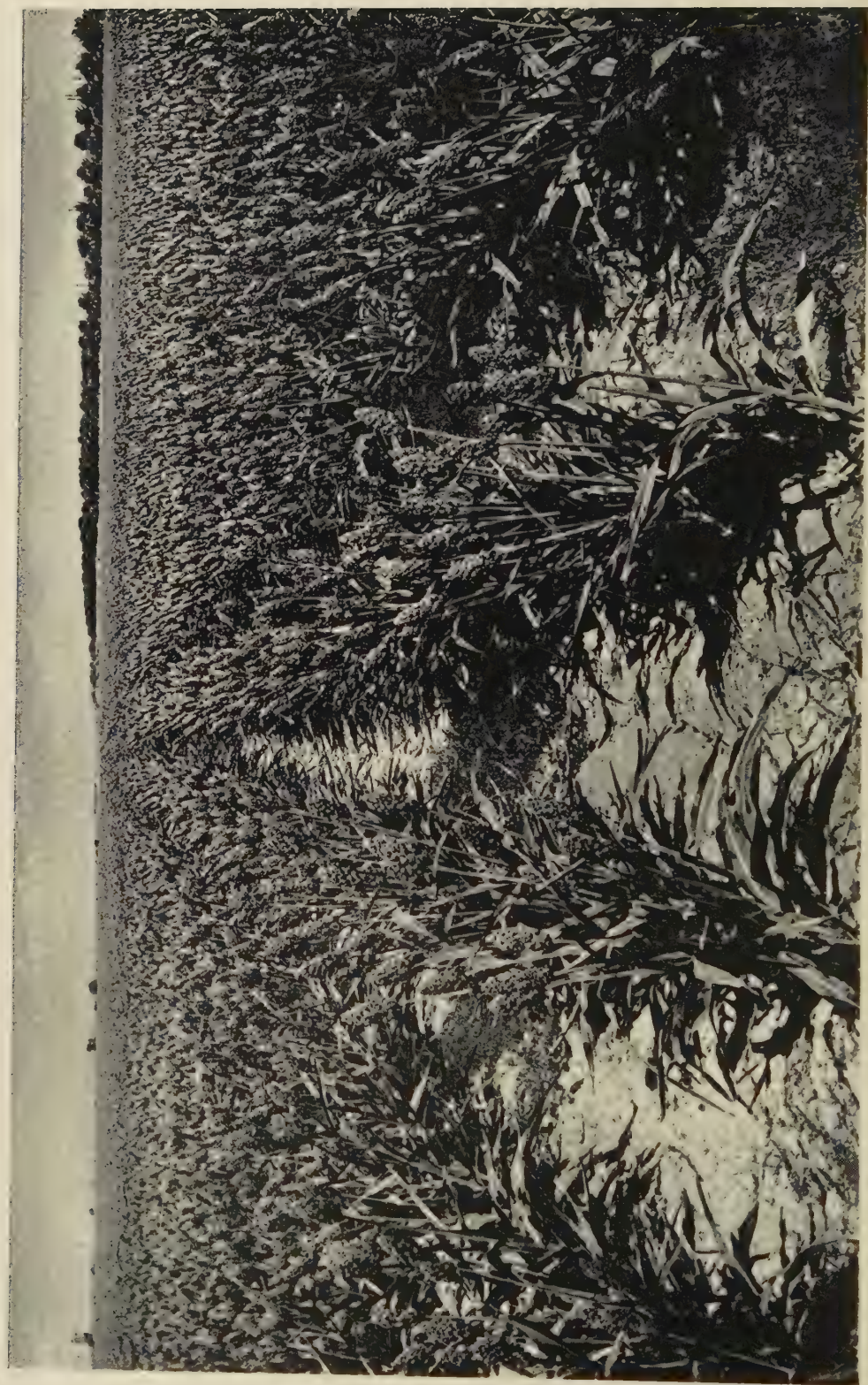
In other tests with adult turkeys and chickens, the amount of folic acid in the blood and also in the eggs was approximately 100 per cent higher when folic acid was added to the diet.

Egg production and hatchability tests will be conducted throughout the laying season to obtain additional information on the influence of dietary levels of folic acid on the amount in the blood and in the eggs.

Lower Rio Grande Valley Cotton

Results of experiments conducted at the Weslaco station during the past five years show that it is possible to produce yields of 1 1/16-1 1/8-inch cotton ranging around two bales per acre. Wilds cotton having a length of 1 1/4 inches will regularly produce yields ranging around 1 1/4 bales per acre when grown under irrigation in the delta region of the Lower Rio Grande Valley.

Cotton produced under irrigation and defoliated just prior to picking, has spinning quality equal to the better types of American upland cotton grown under more humid conditions.



New Combine Varieties of Milo

Texas Milo, Texas Double Dwarf Milo and Sooner Milo No. 8 are all new varieties resistant to Pythium root rot. They have been developed and distributed by the Station since 1937 to replace similar old varieties of milo which were susceptible to this disease. For many years, milos have been the most dependable and widely grown grain sorghum but, unfortunately, they are not well adapted to modern methods of harvesting with the combine harvester. A Double Dwarf Sooner, or "60-Day" milo, although not previously in existence, appeared to offer the best possibility to develop a pure variety of milo suitable for harvesting with the combine.

Both a yellow and white-seeded variety of Double Dwarf Sooner milo were developed by the Station in 1943 from selections in the third generation from a cross between Early White milo and Double Dwarf Yellow milo. The first-named parent contributed earliness and white seed and the latter dwarfness and yellow seed. In this hybrid there is a linkage between one of the factors for dwarfness and maturity, and these two double dwarf varieties were recovered following a cross-over.

Both the white and yellow varieties were increased at the Amarillo, Chillicothe and Lubbock stations in 1945 when several thousand pounds of seed were grown for distribution to other stations and to farmers and seed growers. In 1946, the Station, farmers and certified sorghum seed growers produced several hundred acres of these two new varieties and liberal seed supplies, estimated at 250,000 pounds, were made available for general planting. See Figure 14.

These 2 Double Dwarf Sooner milos are identical except for color of seed. They are pure milo derivatives of early maturity and double dwarf height that can be harvested with the combine. The stalks are slender, bear 10 to 12 leaves, tiller freely, tiller heads maturing about the same time as the main head, will not stand long after frost for combining and should be harvested before or shortly after frost. Heads are typical milo, oval, compact with short seed-branches, and exertion from the boot is good. Seed are large, clean and bright and free from objectionable pigments found in most sorghum grain, and should be among the most suitable for the manufacture of starch and similar industrial uses.

These varieties bloom in 60 days or less and mature in around 90 days. They are, therefore, among the earliest and surest producing varieties of grain sorghum and are well adapted to late planting in North Texas in the latter part of June. They can be

planted the first part of July when necessary with more assurance of producing a grain crop than any other variety.

Sooner milo will head out and produce a grain crop under conditions so severe that most other varieties would fail. When planted too early, however, the plants will be small, put on only a few leaves before the head is initiated, and the yields will be low. Yields, efficiency of combine harvesting and lodging will be improved by closer spacing or thicker seeding of this early variety.

All of the milos are quite susceptible to charcoal rot, a fungus disease which causes sorghum plants to lodge or fall down following maturity. Otherwise, Double Dwarf Sooner milos would probably be leading combine varieties throughout the sorghum area. Fortunately, these two new combine varieties are adapted to late planting and planting late is one of the best means of evading this disease.

Killing Persimmon and Sassafras Sprouts

East Texas fields commonly show about 100 to 10,000 persimmon or sassafras sprouts per acre before they are grubbed to plant crops. As they resprout within a few weeks after cutting, these sprouts are usually chopped off three or more times annually in each field

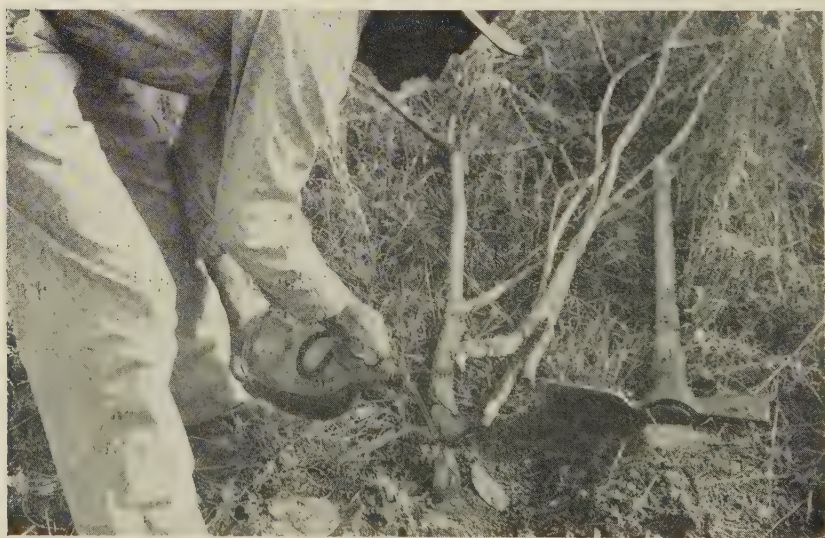


Figure 15. Sassafras and persimmon sprouts have been easily killed at the Jacksonville laboratory by cutting off the sprout just below the ground level and pouring a weed-killing solution on the freshly-cut stump.

of main crops. Grubbing sprouts has been an important annual task in crop production.

Experiments at the Jacksonville laboratory in the past three years have shown that pouring Ammate (ammonium sulfamate) solution on the freshly cut stumps prevents most of them from resprouting. The Ammate is dissolved in water in a concentration of two pounds per gallon of water. This solution is poured from a small kerosene can or bottle with a pouring spout onto the freshly cut stumps that are less than 1 inch tall, Figure 15.

Ammate is conducted into the tree roots well enough to prevent the production of new sprouts from most of them. Careful workmen can kill three-fourths or more of the sprouts in a field with the first application of Ammate. It usually is more convenient to poison sprouts in the fall before they shed their leaves.

Poisoning the sprouts in a field each fall usually controls them well enough for the following year, and progressively becomes a smaller job until sprout grubbing becomes unnecessary within a few years.

Killing sprouts and little trees with Ammate costs about one-fourth of a cent each.

Gains of Progeny of Herd Bulls

The Balmorhea station winter-feeds young bulls for rapid development and to determine gains of progeny of the herd bulls used by cooperating breeders, Figure 16. The over-all object of the work is the improvement of range cattle. The work has shown two principal benefits: The cooperating breeders are able to select for



Figure 16. A progeny group at close of 1945-46 trial.

sires animals proven for ability to gain, and young bulls which are well fed the first winter after weaning grow more rapidly than unfed bulls.

In an analysis of the gains of 32 sire groups used in a three-year period, a significant part of the variation among the progeny was found to be due to heritable differences. According to the intra-year half-brother correlation method the heritability value was approximately 80 percent. This value may be somewhat too high, as corrections were not made for some environmental conditions which existed prior to the feeding period. There is no doubt, however, that the value is large enough to indicate that considerable progress in increasing the rate of gain can be made by selection of herd sires.

Results of four tests show that satisfactory development and gains result from self-feeding mixed rations consisting of 12 percent cottonseed meal, 20 percent ground alfalfa hay and 68 percent ground hegari bundles.

Oats in Poul Starter Rations

In a recent feeding test, the Station found that high mortality and low gains in body weight occurred in a group of broad breasted bronze poults which were fed a ration containing 20 percent coarsely ground oats. In another group receiving a ration containing 20 percent finely pulverized oats instead of the coarsely ground oats, low mortality and high gains in body weight occurred.

The highest mortality in the group fed coarsely ground oats was observed the second and third weeks of growth with a mortality of 38 percent during the first three weeks, as compared with no mortality for the group getting finely pulverized oats. Finely pulverized oats required 1.95 pounds of feed to produce one pound of gain in body weight while the coarsely ground oats required 2.80 pounds of feed to produce one pound of gain in body weight.

Rice Fertilizer Studies

Efficient use of fertilizers has been very important in the production of rice during the past several years. One of the contributing causes has been the scarcity of fertilizers with the desired nitrogen content. Also, the limited area suitable for rice growing has made it necessary to crop the land more often than has been found to be advisable for maximum yields. However, the higher price received by the grower for rice has made the increases obtained from fertilizers very profitable.

Studies on fertilizer practices for rice at the Beaumont station

include various treatments in combination with four rotations, several rates of nitrogen applied at different stages of growth of the plants, heavy nitrogen treatments, and the use of several materials as sources of nitrogen for rice.

The rotation that included *Sesbania* produced the largest average yield of 2,191 pounds of rough rice per acre, as compared with the smallest yield of 1,568 pounds obtained from plats that had been cropped to Alyce clover. However, the Alyce clover on these plats had made practically no growth the preceding year. Phosphoric acid alone did not increase the yield of rice. The use of 40 pounds of nitrogen per acre increased the acre yield by 713 pounds. The largest increase in yield was obtained from the application of 40 pounds per acre each of nitrogen and phosphoric acid in combination with potash. This increase in yield returned a profit of approximately \$30 per acre.

Applications of nitrogen to rice at the time of seeding were more profitable than similar treatments made at a later date. The average yield from all plats receiving nitrogen at the time of seeding was 2,356 pounds per acre, as compared with 1,792 pounds from plats fertilized just prior to the second flooding. The largest yield of 2,812 pounds per acre was produced by the plats receiving the largest amount of nitrogen (60 pounds per acre) at the time of seeding. This increase returned a profit of approximately \$54 per acre.

Nitrogen was applied to rice at rates of 60, 80, 100 and 120 pounds per acre. Both sulphate of ammonia and cyanamid were used in this test. There was practically no difference between the results obtained from the two fertilizers. Yields increased as the amount of nitrogen used became larger. The use of 60 pounds of nitrogen produced 3,165 pounds of rice per acre, and the 120-pound rate gave a yield of 4,080 pounds. Unfertilized plats produced only 2,085 pounds of rice per acre. The 120 pounds of nitrogen per acre gave a profit of approximately \$80 per acre.

Uramon, sulphate of ammonia, cyanamid, ammonium nitrate, nitrate of soda, and a combination of sulphate of ammonia and nitrate of soda were applied to rice at rates to supply 60 pounds of nitrogen per acre. The largest acre yield of 2,852 pounds was obtained from the use of Uramon. However, sulphate of ammonia produced a yield of 2,691 pounds. The lowest yield of 2,130 pounds per acre was obtained from the use of nitrate of soda. The use of sulphate of ammonia (Uramon not considered as price and availability not known) returned a profit of approximately \$45 per acre.

Legumes and Phosphate for the Blacklands

Organic matter and nitrogen have been shown to be important factors in the management of Blackland soils. Legumes (notably hubam sweet clover) in the cropping plan as winter cover and green manure, or as cash crops for forage and seed production, reduce soil erosion and increase yields of crops that follow them.

The phosphoric acid content of Blackland soils is above the average insofar as the soils of the State are concerned. However, the high lime and colloidal clay content of these soils tie up the bulk of the phosphate with the result that the readily available phosphorus for plant growth is low. Phosphate fertilizer applications for cotton, corn and small grain in tests at the Temple station, have not given economical responses. Legumes, however, do respond to phosphate fertilization with increased forage and seed production. This additional growth increases the organic matter and nitrogen content of the soil.

A successful legume program in the Texas Blacklands depends on the phosphate nutrition of the legume bacteria as well as on the legume plant itself. Experimental work and observations have shown that legume inoculation alone or phosphate fertilization alone is not enough to insure good legume growth. When inoculation and fertilization are combined, excellent legume growth has been obtained. Evidence has also been obtained which shows that the closer the phosphate fertilizer is to the inoculum in the soil, the more the legume will grow. This supports the idea of "feed phosphorus to

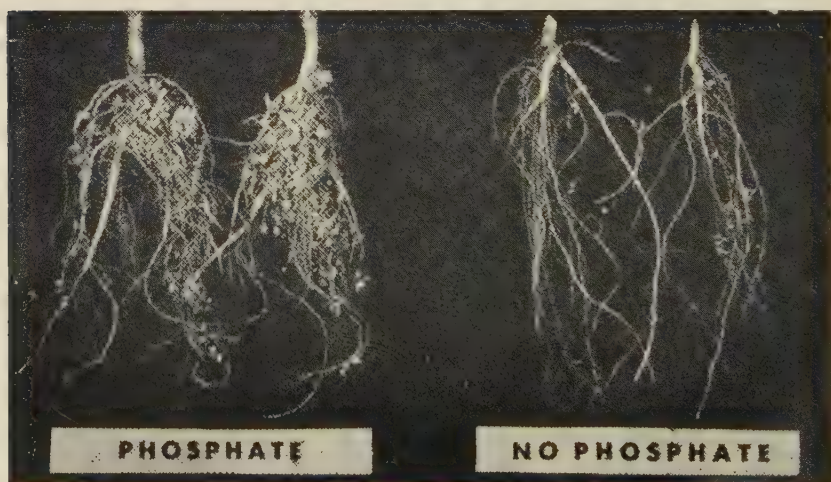


Figure 17. Effect of phosphate fertilization on nodulation of Austrian winter peas growing on Wilson clay loam.

the legume bacterial which in turn feed nitrogen to the host plant." See Figures 17 and 18.

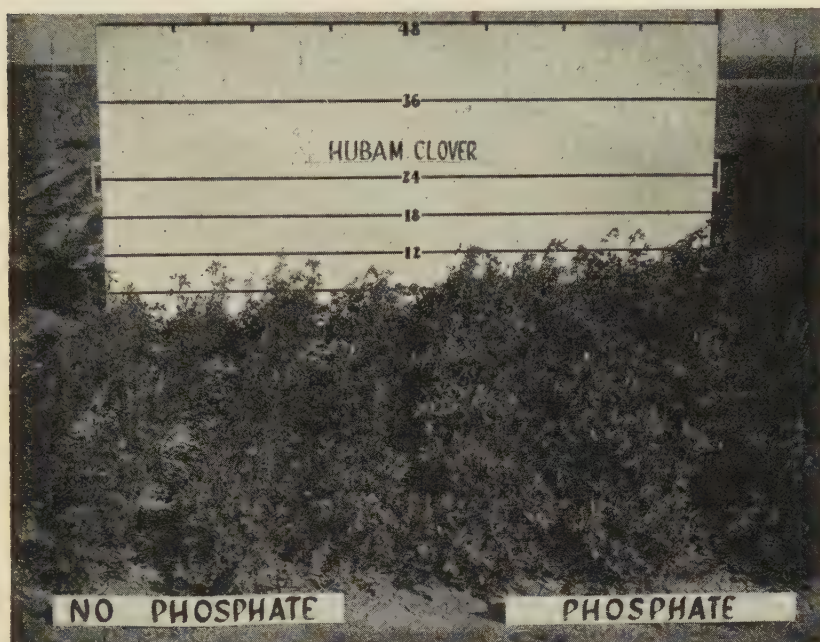


Figure 18. Effect of superphosphate on growth of hubam clover growing on Austin clay soil. Seed were planted Oct. 3, 1945. Picture was taken March 20, 1946. The phosphate fertilizer was placed in the soil in contact with the inoculated seed.

Mesquite Eradication

Practical eradication of mesquite on range and pasture lands involves the development of a simple and economical method whereby not only the present brush is destroyed, but also one which will permit control of seedlings. Of the many methods and chemicals that have been tested at the Spur station since 1939, none has been found that provides the final answer. There are a few methods that show enough promise to warrant their use on a wider scale by farmers and ranchmen until cheaper and more effective methods are developed.

The fundamental principle is to kill the dormant sprout buds on the underground stem. These buds are small wart-like structures that resemble the eyes of an Irish potato and give rise to new sprouts if the top-wood is killed. In the mesquite tree, common to the ranges and pastures of Texas, the zone of buds is generally

located from three to eight inches below ground level and varies with growth form, amount of soil deposition and soil type, Figure 19.

The reason why mesquite is difficult to eradicate is that whenever the top is killed, whether by fire, frost, browsing, by removal with a mobile tree saw or other means, new sprouts arise from the buds and often grow into a tangled mass of stems. This results in an even more complex problem than the original growth because the new stems form a trap for debris and soil accumulation which further buries the critical bud zone.

Kerosene, diesel fuel and other cheap oils have been used successfully and economically to eradicate open stands of single to few-stemmed mesquite growing on soils that are porous and absorb oils to great depths. Many-stemmed mesquites growing on heavy soils have not been treated economically because large amounts of oils are required to reach all the buds on the underground stem.

Sodium arsenite has been used economically and successfully to kill single-stemmed mesquite by treating frills cut near the soil level, and by removing the topwood of many-stemmed brushy mesquite and poisoning the sapwood. It is highly effective on

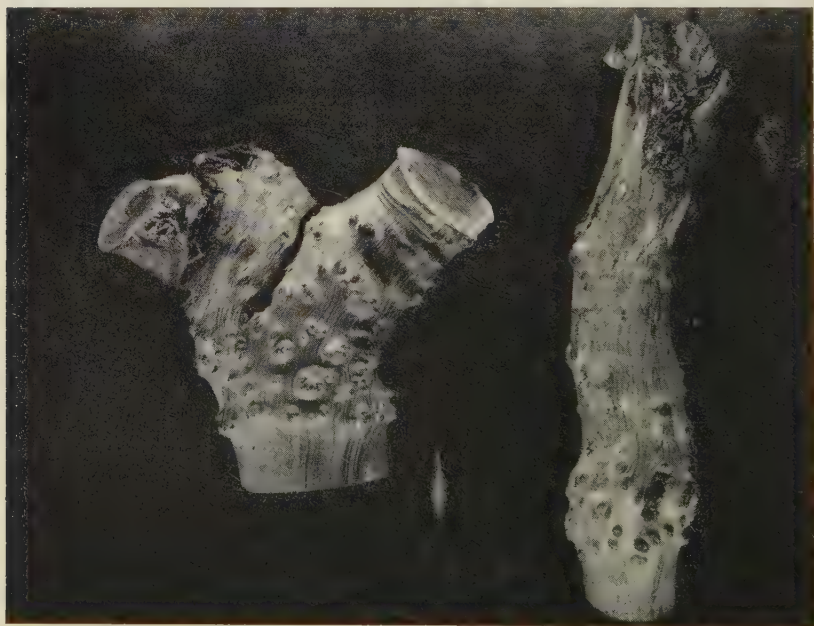


Figure 19: Dormant buds on underground roots and stems of mesquite. Note the shallow depth of buds on the stump to the left which was found growing on upland and the relatively deep location of buds on the plant to the right that was found growing in a flat where heavy soil deposition has occurred.

porous and heavy soils. The chief disadvantage of this method is the highly poisonous nature of sodium arsenite when handled carelessly.

Grubbing with power machinery is adapted to use by large operators or to custom work where the areas to be treated are large enough to justify the initial cost of equipment. The root cutter is better adapted to clearing open stands of trees, while the pull cutter is better adapted to dense stands of brushy mesquite.

Hand-grubbing is an effective method to remove scattering stands of mesquite trees and seedlings. It is usually too costly to clear moderate or dense stands of mesquite.

Spraying chemicals on sprout growth of mesquite has not been developed successfully for practical eradication of mesquite.

Every type of mesquite eradication will require control of seedlings already established, those that come from seed on the ground, and from seed brought in by grazing animals and other means.

Crops Following Grain Sorghum

Tests at the Denton station over a period of 5 years show that grain sorghums materially reduce the yields of following crops unless as much as 6 months intervene between plowing under the sorghum and planting the next crop. See Figure 20. More time is required for complete rotting of sorghum stubble and roots than for many other crops. Very little, if any, damage occurs if late spring-planted crops, such as cotton or sorghums, are planted on



Figure 20. Showing usual difference in height of oats on sorghum ground (left) and corn ground (right).

the previous year's sorghum ground. Following grain sorghums with wheat, oats or barley should be avoided whenever possible.

The following data show the per-acre average yield of corn, wheat, oats and barley expressed in bushels, and cotton expressed in pounds of lint for each crop following both grain sorghum and corn: corn, 23.6 and 23.2; wheat, 17.5 and 22.3; oats, 49.5 and 57.7; barley, 31.2 and 37.7, and cotton, 281 and 286.

Corn and cotton yield just as well on grain sorghum land as on corn land in this comparison. No significant differences were found between varieties of grain sorghum in their effect upon following crops.

Hubam Clover in the Wichita Valley

Hubam clover will produce a two-way cash crop in hay and seed, increase soil fertility, and retard root rot losses in succeeding crops, all from one planting and within one cropping season.

A field planted to hubam at the Iowa Park station on Feb. 23, 1946, yielded a cutting of approximately one-half ton per acre on May 25. Following the hay harvest the clover was allowed to grow up and produce seed. On July 30 the seed crop was harvested with a yield of 301 pounds of cleaned seed per acre. With hay selling at \$30 per ton and seed at 20 cents per pound, this represents a gross return of slightly over \$75 per acre.

On an adjoining field where hubam had been grown in comparison



Figure 21. Hubam clover enriches cotton land and retards root rot as shown by the large leafy cotton on the left following hubam, compared with the smaller dead-looking cotton on the right where cotton followed cotton.

with other rotation crops the previous year, cotton following hubam produced 112 percent more lint per acre than cotton following cotton, and 67.5 percent more than cotton following grain sorghum. See Figure 21.

Superphosphate Versus Rock Phosphate

Results of Station pot experiments show that superphosphate is often an excellent fertilizer for grasses and may increase both yield and content of phosphoric acid, thereby increasing their feeding value.

On the other hand, rock phosphate is often not an efficient carrier of phosphoric acid and, even in very large amounts, does not adequately increase yields or the phosphoric acid content of the grasses.

Cattle Adaptability Studies

Twenty-nine high grade Hereford heifers were purchased in 1934 to use in adaptability studies at the East Texas Pasture Investigations Field Laboratory at Lufkin.

These cattle and their offspring were grazed on improved pasture that furnished an abundant supply of forage for approximately nine months of the year—March through November. Chemical analyses of the forage showed well above the minimum requirements for beef cattle in protein, calcium and phosphorus. The original cows and their offspring reached a very satisfactory mature weight, but the calves grew off very slowly and made poor gains as yearlings, even though they were fed during the winter.

In 1940, a Brahman bull was used on the Hereford cows. The first crop of cross-bred calves was dropped late in the summer and fall of 1941 and grew off slowly until the next spring, but they made very satisfactory gains from there on to maturity.

These half Hereford-Brahman cows and a half Hereford-Brahman bull were used in further crosses, and the progeny was compared with grade Herefords during 1944, 1945 and 1946. Calves were produced from a Brahman bull on Hereford cows, Hereford bull on Hereford cows, and Hereford bull on half Hereford-Brahman cows.

The data indicate marked advantages in weight for age for Hereford-Brahman crosses over straight Herefords, particularly when the Brahman blood is on the side of the dam.

Calves from the first cross of the Brahman bull on Hereford cows have a tendency toward the roughness of the Brahman cattle.

They have a small hump, steep rump, heavy dewlap, are leggy and are inclined to be light in the lower round.

The $\frac{3}{4}$ Hereford- $\frac{1}{4}$ Brahman calves from both crosses (Hereford bull on cross-bred cows or cross-bred bull on Hereford cows) are much smoother than the first cross. These calves, as compared with Herefords, are inclined to be plain-headed, their ears are large, and they are possibly a little leggier, but otherwise of pretty good body conformation. There is no difference showing between the two types of crosses except the calves from the cross-bred cows carry much more flesh to weaning age.

The $\frac{3}{4}$ Hereford- $\frac{1}{4}$ Brahman calves are more likely to have Hereford color than the half-breed cows. However, there are probably more brindles and black or brown calves than red calves with a white face.

Rice Varietal Work

The rice breeding program at the Beaumont station has resulted in the development of two widely grown rice varieties well adapted to combining and drying. In 1946, over 100,000 acres of the Texas crop were sown to these varieties, Texas Patna and Bluebonnet.

Texas Patna is a cross between Rexoro and C.I.5094, released in 1942, which matures in 150 to 170 days. Bluebonnet was devel-



Figure 22. Shows an interior view of the tunnel-type sack rice dryer constructed by the Texas Rice Improvement Association on the new experimental farm west of Beaumont. Sacks are placed over the holes, dried 3 to 6 hours, then turned and dried 3 to 5 hours additional, depending upon the amount of moisture to be removed.

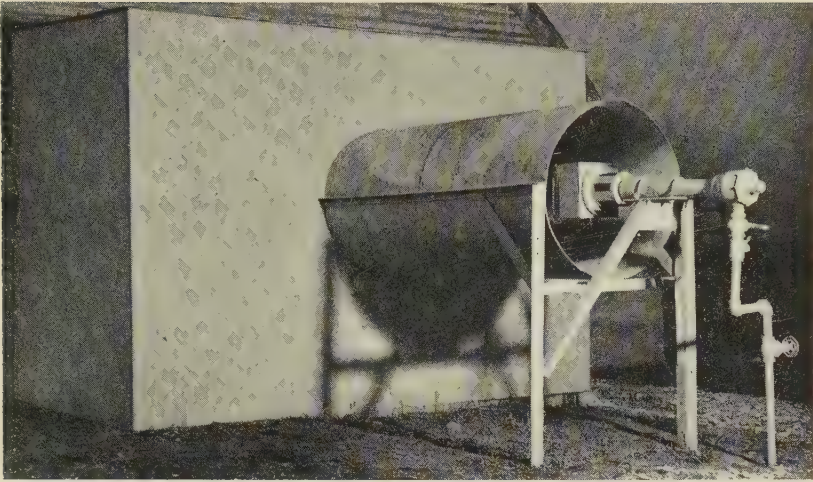


Figure 23. Shows the fan house and air intake and burner. Butane gas is used as a fuel. The Beaumont station assisted in the design and operation of the dryer which was used for drying seed rice. By drying the seed in the sack the mixing which occurs in the bulk dryers is avoided.

oped from a cross between Rexoro and Fortuna and was released in 1944. Bluebonnet matures in 120 to 135 days. Both varieties are long slender grain types of excellent milling and cooking qualities.

Further improvements in combine types similar to Texas Patna and Bluebonnet are in progress, particularly for shorter, stiffer-strawed varieties possessing more resistance to leaf spot diseases. Among the more promising material which will soon be ready for release are selections from a cross of Rexoro and Nira.

In connection with the seed rice increase program, a seed rice dryer was designed and built at the station in 1946 for drying rice in sacks, thus preventing varietal mixing which is so serious in commercial bulk grain dryers. See Figures 22 and 23.

Longer Staple Length on Fine Wool Sheep

Texas fine wool has long been favorably received by the wool trade because of its good quality. One of the greater criticisms of these fine-wools has been that too small a percentage has been long enough to grade as strictly staple, or combing wool.

Rambouillets and Romneys have been crossed by the Station to transfers from the Romney genes for more rapid fiber growth which result in greater staple length. The first generation progeny had about 4-inch staple, but the fibers were too coarse to grade as fine.

These were back-crossed to Rambouillets to bring back the required fineness, the longest stapled progeny being retained for the next back-cross to Rambouillets.

There are now a few animals of $\frac{7}{8}$ and $\frac{15}{16}$ Rambouillet breeding which have strictly fine wool $3\frac{1}{2}$ to 4 inches in length. These are being bred together to stabilize the inheritance of the genes concerned with staple length, and to obtain a finewool sheep which will breed true for 4-inch staple.

Breeding Peaches for a Mild Climate .

Considerable areas in the southern part of Texas have suitable soil for the production of deciduous fruits. Spring comes early and is favorable for the production of early fruit. The single factor that now prevents a commercial peach industry in this part of the State is the lack of sufficient cold weather for the normal development of present commercial varieties. This can be remedied by the breeding of new varieties.

The Honey varieties are well adapted to South Texas from the standpoint of climate, but the fruit is too soft to ship. Crosses have, therefore, been made by the Station between several varieties of Honey peaches and commercial sorts. Since ability to yield well after a mild winter is an important goal, an estimate of seedling production has been given careful consideration in making selections. These selections have been crossed back to the commercial type in order to combine adaptation to a mild winter with those characters that permit commercial production.

One tree of Florida Gem x Early Elberta gave the best production of any first generation seedling. Selections were crossed again with Eclipse and with Stark's Early Elberta, both early freestones of commercial quality. Of the two crosses, selections of the latter have been by far the best adapted, although the most productive trees still have fruit with white flesh. A yellow freestone selection of the cross to Stark's Early Elberta has been crossed again to the commercial type—this time to Burbank Early July Elberta. Seedlings from this second "back-cross" will be grown in the spring of 1947. Figure 1 illustrates a fruit from (Florida Gem x Early Elberta) x Halehaven. It is a yellow freestone ripening before the middle of June.

Another promising cross is between Halehaven and Luttichau. Since yellow flesh is recessive, all of the seedlings have white flesh. A large proportion of the trees produce well after a mild winter

and many have a firm flesh fruit. Figure 2 illustrates the type of fruit obtained from this cross. The picture was made on June 12.

More crosses have been made with Pallas than with any of the other Honey varieties. It has been crossed reciprocally with Hiley,

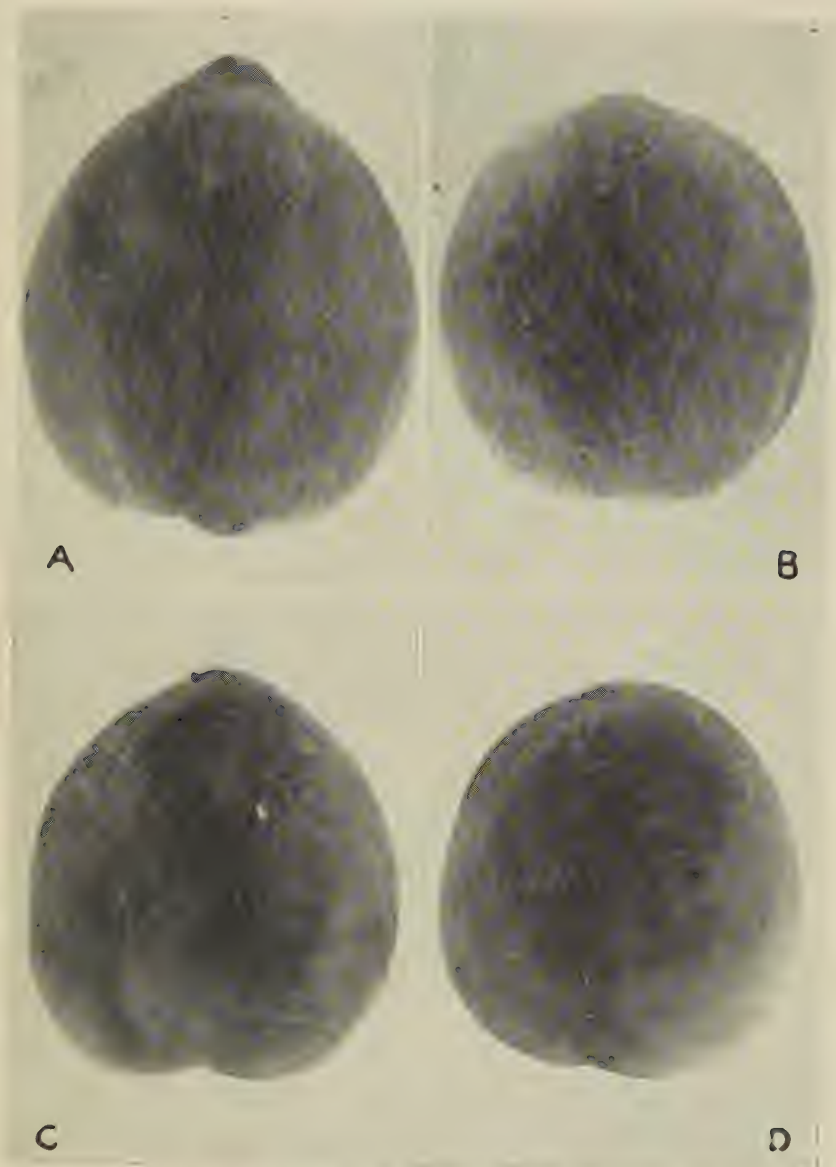


Figure 24. (A). A82-1. (Florida Gem x Early Elberta) x Halehaven. An early yellow freestone. (B). A76-30. Halehaven x Lutchau. Ripened June 10, 1946. (C). A71-5. Globehaven x (Smith x Hiley). Harvest began June 4, 1946. (D). Burbank Early July Elberta.

since that commercial variety is adapted to rather mild winters. One selection from each cross (direct and reciprocal) has been made for testing as a home orchard variety. These first generations have been crossed with Eclipse, Globehaven, Golden Jubilee, Rochester and Stark's Early Elberta—all early commercial yellow freestones. A good deal of the pubescence of Rochester appears in this seedling. Another cross has been made with Bestmay to secure early seedlings, one of which has been crossed with Newday. One selection of the cross with Globehaven was crossed in 1946 with Triagem and another selection was crossed with Valiant. Most of these varieties ripen in June with a few in early July.

Smith, a later Honey type, has also been crossed with Hiley and selections crossed with Globehaven, Halehaven, Stark's Early Elberta and St. John. All of these crosses are yielding promising material except the one with St. John. Figure 3 pictures a fruit from the cross with Globehaven.

One more group of Honey crosses involves Triana x Belle (of Georgia). A part of the first generation trees have clingstone fruit. The fruit shape obtained varies in crosses with different varieties. A rather prominent tip appears in crosses involving the Halehaven variety. Apparently the globe shape of Globehaven is dominant.

Burbank Early July Elberta is illustrated in Figure 4 for comparison with fruits of the seedling selections.

In general, the seedlings compare favorably with the commercial varieties with respect to size, shape, color, flavor and season. It is still too early to tell definitely about shipping quality and yield, but preliminary observations indicate that they hold considerable promise.

Legumes for Soil Improvement

Winter legumes made favorable growth at College Station during 1945-46, but the following cotton and corn crops were not typical of this section, due to the adverse weather conditions at planting time. However, during the last 10-year period plowing under vetch fertilized with 500 pounds of 0-8-4 fertilizer increased the yield of cotton about 40 percent. In 1945 and 1946, corn which received only the residual effect of the vetch and fertilizer, produced an average of 40 percent more than corn grown on untreated soil.

Six methods of preparing the land and seeding vetch for cotton have been compared during the years 1944, 1945, and 1946: (1) sowing the vetch seed broadcast and flat breaking the land to cover

the seed; (2) planting the vetch with a grain drill on unprepared land; (3) bedding the land and seeding the vetch in "twin" drills on the beds; (4) plowing the land and planting the vetch with a grain drill; (5) broadcasting the vetch seed and running a sweep



Figure 25. Showing methods of seeding vetch. At the top, the vetch was planted on ridges; at the bottom, the vetch was seeded on unprepared land and the middles were plowed out with a sweep.

or buster between the cotton rows to cover the vetch seed, and (6) seeding the vetch with a grain drill on disked land. See Figure 25.

There was no significant difference between the yields of cotton for the three years for the different methods of preparing the land and seeding the vetch. However, during wet winters and springs, vetch thrives better on ridges or beds because of the better drainage provided by the beds.

Nitrogen Fertilization on Small Grain

During the wet, cool months, the heavy soils of the Texas blacklands are often very wet. This condition is not conducive to micro-biological activity and liberation of soil nitrates. All grasses suffer and do not grow well during this period of low available soil nitrogen.

Small grain planted at the Temple station early in October 1945 produced 355 pounds of dry forage and 63 pounds of protein by Feb. 20, 1946. A similar area which received 150 pounds of ammonium nitrate per acre produced 680 pounds of forage and 141 pounds of protein per acre during the same period. See Figure 26. This additional forage was available for livestock grazing during the winter months when high protein grazing is scarce.

A spring top-dressing of 25 pounds of ammonium nitrate fertilizer per acre on Austin clay soil in early March increased oat



Figure 26. Urine spots in an oat field on Austin clay soil. This picture was taken in early March, 1946. When this condition exists, it is an indication that the available soil nitrogen is low and that the small grain would respond to a top dressing of nitrate fertilizer.

yields from 35 to 43.2 bushels per acre. The same fertilizer treatment on Houston black clay soil increased yields from 39.3 to 50.7 bushels per acre. In another experiment on Houston black clay where oats followed hubam sweet clover in the rotation, 0, 25, 50, 100 and 200 pounds of ammonium nitrate per acre gave 48.3, 48.4, 53.3, 47.7 and 53.3 bushels of grain per acre, respectively. It may be concluded from these data that the legume in the rotation produced sufficient nitrogen for the small grain crop that followed.

Handy Turkey-catching Chute

A practical turkey catching chute has been used successfully at the Station poultry farm, Figure 27.

This equipment consists of an elevating chute and a section in which the floor is on the same elevation. The chute is $7\frac{3}{4}$ feet long, 18 inches wide with 34 inches height at the upper end, and there is 34 inches head clearance for the birds as they go into the chute. The longitudinal section, as shown in Figure 27, is 10 feet long and 18 inches wide.

The floor is 34 inches off the ground. The opening is 14 inches high, which is satisfactory for the hens. The 4-inch board at the top of the opening is removed when working with toms, making the opening 18 inches in height. There is a 1 x 1 inch strip on the front edge of the floor to prevent the turkeys from slipping out. The purpose of the sacks in the foreground is to give the effect of a solid wall as turkeys ordinarily do not lower their heads



Figure 27. Turkey-catching chute in use at the Station poultry farm.

in an attempt to crawl through a hole. These sacks are loose at the bottom and the worker can reach in at any place and catch the bird he wants.

Insects of Legumes and Cotton

As the growing of cotton in rotation with or adjacent to legumes is increasing, the possible effect of such rotation on insect injury to cotton is important.

In 1946, population studies of the southern green stink bug, tarnished plant bug and rapid plant bug were undertaken by the Station in Brazos, Burleson and Washington counties in fields of hubam, yellow-blossom clover (*Melilotus indica*), vetch, alfalfa and Austrian winter peas. Large populations of the southern green stink bug developed only in fields of hubam grown for seed. Populations of the tarnished plant bug and rapid plant bug were very low.

A few fields of cotton following plowed-under legumes were checked for boll weevil, flea hopper and bollworm infestation. It was found that infestations were no higher in such fields than in others where cotton followed corn or cotton.

Final conclusions cannot be drawn from one season's work, but it is obvious that populations of stink bugs sufficiently large to



Figure 28. Comparison of different dusting schedules using calcium arsenate for boll weevil and bollworm control. Cotton on left untreated, yielded 823 pounds seed cotton per acre. Cotton on right received 11 applications from May 25 to August 5, yielded 1,301 pounds seed cotton per acre. Another adjoining plat received 6 applications from July 12 to August 12, yielded 1,297 pounds seed cotton per acre.

constitute grave damages to cotton can develop in fields of hubam grown for seed.

New Corn Crosses

In the spring of 1946, the Station sent one of its corn breeding scientists to Guatemala, an age-old center of corn production. See Figure 29. It was hoped that a study of field corn varieties of this



Figure 29. A primitive corn field in Guatemala showing the ancient Indian method of "hilling" the corn. The land is broken and cultivated entirely with hand tools such as hoes and spades. The crop was gathered shortly before this picture was taken. Contrast with Figure 50.

region would reveal characters which would be beneficial to the Texas corn breeding program, especially the development of varieties more resistant to heat, drouth, insects and diseases.

En route to Guatemala, observations were made in Mexico of corn breeding work conducted by the agricultural staff of the Rockefeller Foundation.

Headquarters were established in Guatemala at Antigua, where a tropical research center is maintained by Iowa State College.

Although corn samples were collected in practically all the major corn-producing areas of Guatemala, most of those brought back to the Station were collected in areas typifying three main corn growing factors; hot and dry climate, altitudes ranging up to 9,500 feet and abundance of insects.

About 275 samples were brought back to Texas, the majority being chosen because of the observed advantage, in one respect or another, which they seemed to have over Texas corn.

It is hoped that crosses between Texas and Guatemalan corns will yield improved inbred lines, which will be used as parents to make the field corn hybrids.

Grazing Special Crops

A livestock system of agriculture based on forage from erosion-resistant and soil-building crops has proved to be profitable for the Texas Blacklands, Figure 30. A soil cover of close-growing small grains and legumes reduces soil erosion, and the legumes build up the fertility of the land. Harvest of these crops by livestock eliminates heavy labor loads and returns the manure to the land for fertility maintenance.

Oats-hubam, where oats are to be harvested, provides winter grazing from Nov. 1 to March 1; hubam sweet clover can be grazed from March 1 to July 1; and sweet Sudan furnishes forage from July 1 to Nov. 1. A grazing sequence of this type provides year-round grazing of highly palatable nutritious forage.

During 1945 and 1946, grazing of oats-hubam on Houston black clay soil produced 178 pounds of beef per acre during the winter months; these oats later produced 38 bushels of grain per acre. Grazing of hubam during the spring and early summer of 1946 produced 309 pounds of beef per acre. Sweet Sudan has produced 360 pounds of beef per acre when grazed in the summer and early fall.

Badly eroded upland soil infested with Johnson grass can be made productive by seeding it with oats and hubam clover. A field of this

type at the Temple station provided grazing from Dec. 5, 1945, to Aug. 14, 1946, and produced 173 pounds of beef per acre.

Early seeding, preferably in September, is necessary for early winter grazing from small grain and legumes.

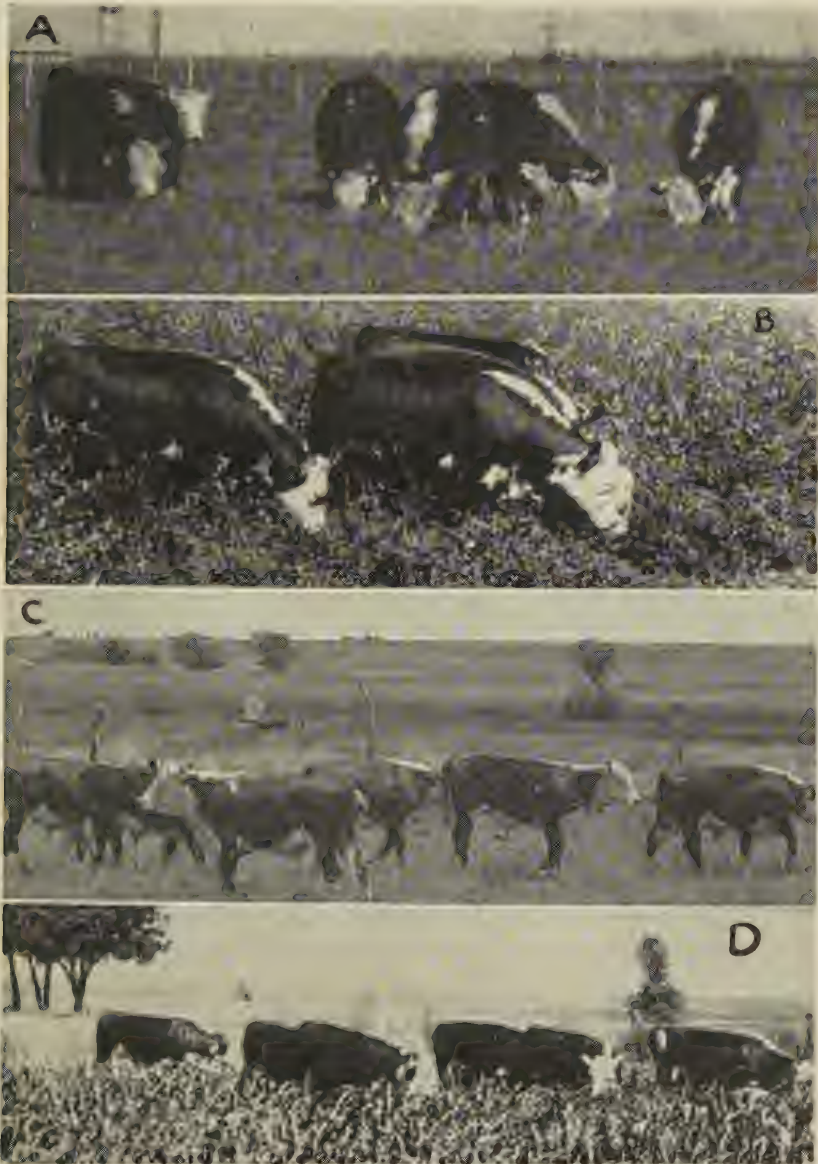


Figure 30. These pictures show steers at the Temple station on oats-hubam (A) in December, hubam in April (B), eroded Johnson grass land in July (C) and sweet Sudan in July (D). From this mixed grazing, these steers produced 173 pounds of beef per acre from December to August.

Phosphate Increased Alfalfa Yield

Superphosphate applied prior to plowing the land for alfalfa in the fall of 1944 at the Iowa Park station gave no indication of benefit during the 1945 cutting season, but resulted in very substantial increase in yields during 1946, Figure 31. The test included, in addition to a no-treatment check plat series, rates of 200, 400 and 800 pounds of 20 percent superphosphate per acre.

From the beginning of the 1946 growing season the phosphated plats could be identified by their more vigorous growth.

Five cuttings of hay were harvested during the season with yields as follows: no-treatment, 5.3 tons of dry hay per acre; 200 pounds superphosphate, 6.5 tons; 400 pounds superphosphate, 7.2 tons; and 800 pounds superphosphate, 7.3 tons of dry hay per acre. With alfalfa hay selling for \$30 per ton, this means that 200 pounds of 20 percent superphosphate increased gross returns by \$36 per acre, and 400 pounds of superphosphate increased gross returns by \$57 per acre. The superphosphate cost \$28.27 per ton.



Figure 31. Alfalfa on the right received 800 pounds of superphosphate per acre while that on the left received none. The height of the phosphated alfalfa according to marks on the stake is approximately 18 inches; that on the untreated plat only about 12 inches. The picture was taken prior to first cutting in April 1946.

Improved Fruiting in Cotton

For several years research has been conducted by the Station on the effects of light on cotton fruiting, and differences in the reaction of varieties to poor light conditions.

Selected lines from crosses between an Asiatic variety of cotton (Nanking) and common American upland varieties have recently shown unusually good fruiting and growth in the Station greenhouse during the short days and relatively low light intensities of winter. These crosses were originally made by the Station with colchicine. They were later backcrossed to improved upland strains. Offspring of the best-fruited selections have also shown tendencies towards early and abundant fruiting in the field. See Figure 32.

Cotton plants of good size with early and heavy fruiting capacities are desirable for obtaining the best yields.



Figure 32. These 2 cotton plants (pictured Nov. 7, 1946) were grown in the Station greenhouse from seed planted Sept. 14. The plant on the left (Nanking x American upland cross) was representative of 5 similar ones produced by seed of an open-pollinated plant in the field. On the right is a typical Stoneville 2B plant from commercial certified seed. The larger size and better fruiting of the plant on the left may indicate increased photosynthetic activity in this selection.

The White Grub Problem

Detailed information accumulated by the Station on the seasonal and life history of the common and destructive forms of white grubs, the adults of which are May beetles or June bugs, indicates that the degree of infestation may vary widely from year to year, depending upon prevailing weather conditions.

The eggs hatch in about 30 days and the grubs feed upon the roots of various kinds of growing crops, especially grasses, small grains, corn, Irish potatoes, strawberries, onions, and the like. Legumes, cotton and grain sorghums are not generally subject to extensive injury. Most species of white grubs attain full growth after feeding through one growing season; they pass the winter in the soil and transform to beetles during the following season.

After an infestation of grubs has become established, it is difficult to control profitably by application of any direct remedial measures. Where cost of the treatment is not prohibitive, white grubs may be controlled by application of arsenate of lead at the rate of 10 pounds per 1,000 square feet. The insecticide should be distributed uniformly and worked into the upper layers of the soil. However, control of white grubs under field conditions is almost wholly a problem of cultural practice. Heavy losses in crop yields may be averted by the use of adaptable rotations in which crops susceptible to severe injury do not follow each other in consecutive seasons.

Tests of Cotton Varieties

Experiments conducted at several substations and field laboratories during the past five years show several high yielding varieties of cotton with good fiber properties and high spinning performance.

These are Deltapine 14, Stoneville 2B, Rogers Acala 111, and selections from the Rowden and Coker types, including Roldo Rowden, Rowden 41B, Coker 100, Coker 200 and Coker 4 in 1.

A large number of widely grown commercial varieties and strains were compared in these tests with one another, and with newly developed selections and hybrid strains from the breeding blocks of the Station and from the blocks of commercial breeders over the Cotton Belt.

Information from field variety tests, together with the reports on the cooperative spinning tests at College Station, have been fully utilized in the standardized cotton quality improvement program, which has made rapid progress in Texas in recent years.

Yellow Beard Grass

Of the several hundred different introduced grasses tested by the Station during the past 10 years, yellow beard grass (*Andropogon ischaemum*) appears to be one of the most widely adapted and versatile. See Figure 33. Yellow beard grass has been grown from seed and has spread from volunteer seed wherever it has been tried. Recent plantings at the Sonora station, in an area of 24 inches of rainfall per year, have been most encouraging.

From the bulk selection seed material, over 4,000 selected seedling plants have been space-planted for improvement purposes. These seedling plants were transplanted to the field the latter part of April. They produced a growth of approximately 18 inches in diameter during the growing season, and produced approximately 75 pounds of seed per acre from the first seed crop.

Selections will be made from among the spaced plants to produce a leafy, high-forage-yielding selection for increase and distribution.



Figure 33. Yellow beard grass at College Station at the end of the first growing season. Seed was planted with a picker-wheel cotton planter in 40-inch rows at the rate of approximately 1 pound per acre. The area was mowed during the summer to control weeds.

Volunteer Bur Clover on Crop Land

A good volunteer stand of bur clover every fall on cotton, sorghum or Sudan land has been obtained at the Denton station from a single seeding in 1939. In 6 of the intervening 8 years, the bur clover has survived winter freezes, furnished considerable winter and early

spring pasture for livestock, and has improved the soil. Since this clover with mature seed may be plowed under in late April or early May, a good seedbed can be made ready for cotton, sorghum or Sudan by May 15.

The best combination at Denton has been bur clover and Sudan grass, the bur clover providing pasture from November to April and the Sudan from June to September. Usually the Sudan should be one-wayed or plowed under early in September in order to have a good seedbed ready for the volunteer bur clover that will come up following fall rains.

Hornlessness in Rambouillet Sheep

Hornless strains of Rambouillet sheep have long been known. Many sheepmen attach considerable importance to hornlessness for range use because of fly trouble. Two difficulties stood in the way of more satisfactory use. One was the lack of knowledge as to the inheritance of hornlessness in finewool sheep. The other was the occurrence of male lambs with one or both testicles retained in the abdominal cavity. Animals with this defect, technically known as cryptorchids, are commonly called "torunas" by range sheepmen. This occurs very commonly in hornless males, but only very rarely in horned rams.

As a result of experimental crossing of strains and of progeny testing by the Station, it was soon found that hornlessness was dominant, that among rams of appropriate breeding some were easily identified as pure or homozygous for hornlessness, that the cryptorchidism defect was transmitted by simple recessives, and that some rams which were normal were also carriers of cryptorchidism.

The problem was then redirected to breeding procedures designed to increase the probability of raising rams which were free from the gene for cryptorchidism, and were hornless. One of the hornless rams on breeding test still has a clean record and is probably free from the cryptorchid gene.

With the completion of the test and the identification of even one such ram, it will be possible to proceed with the elimination of horns without the danger of introducing cryptorchids into the flock.

Natural Resistance to Stomach Worms

The most important internal parasite of sheep in this area is the common stomach worm (*Hemonchus contortus*). Regular

drenching with phenothiazine has very greatly reduced the seriousness of the problem. The drug has also been mixed with salt for self-medication with good results. However, in the more humid and intensely infested areas, such as found at College Station, the use of the mixture is not adequate. An increase of natural resistance to internal parasites would be of great value even though it might not be of high enough level to entirely eliminate medication.

A small group of sheep and a small group of goats showing a high degree of natural resistance to internal parasites have been bred at College Station. The best of these, from the resistance standpoint, are in part from "scrub" breeding. A few Rambouillets have fairly high resistance. Both the sheep and the goat progenies from the selected groups have higher survival than the respective controls, but not yet high enough.

No Erosion for 20 Years

An aerial view of the Spur station taken at noon, June 19, 1946, 18 hours after a hard, dashing rain of 2.54 inches is shown in Figure 34.

This body of water was brought onto the Station from highlands and made to cover over 200 acres of cultivated lands having gentle slopes. The water entered the farm very muddy and the unused surplus left practically clear at a point near the upper left hand corner of the picture. The head of the water at the time the picture was made was still one-half mile from the exit in a straight line and over two miles the way it had to travel above the semi-closed level terraces. There was a net gain in soil insofar as this rain and this farm are concerned.

Sweet sorghums planted 10 days after the flooded area was drained yielded 12.12 tons of silage per acre. The quick maturing Early Hegari, developed at the Chillicothe and Lubbock stations, planted at the same time produced up to 3,000 pounds of combined grain per acre. As there was no rainfall for a 70-day period following this rain, and as 35 of the days had a temperature of over 100 degrees, many of the areas not flooded made complete failures.

Determination made with soil augers following this rain showed depths of moisture penetration to be as little as six inches on heavy grazed pasture lands on the watershed and to be over six feet in the watertrap. Yearling steers on the heavy grazed watershed lost .32 pound daily during the summer grazing while steers on well-flooded bottom grasslands made a daily gain of 1.93 pounds.

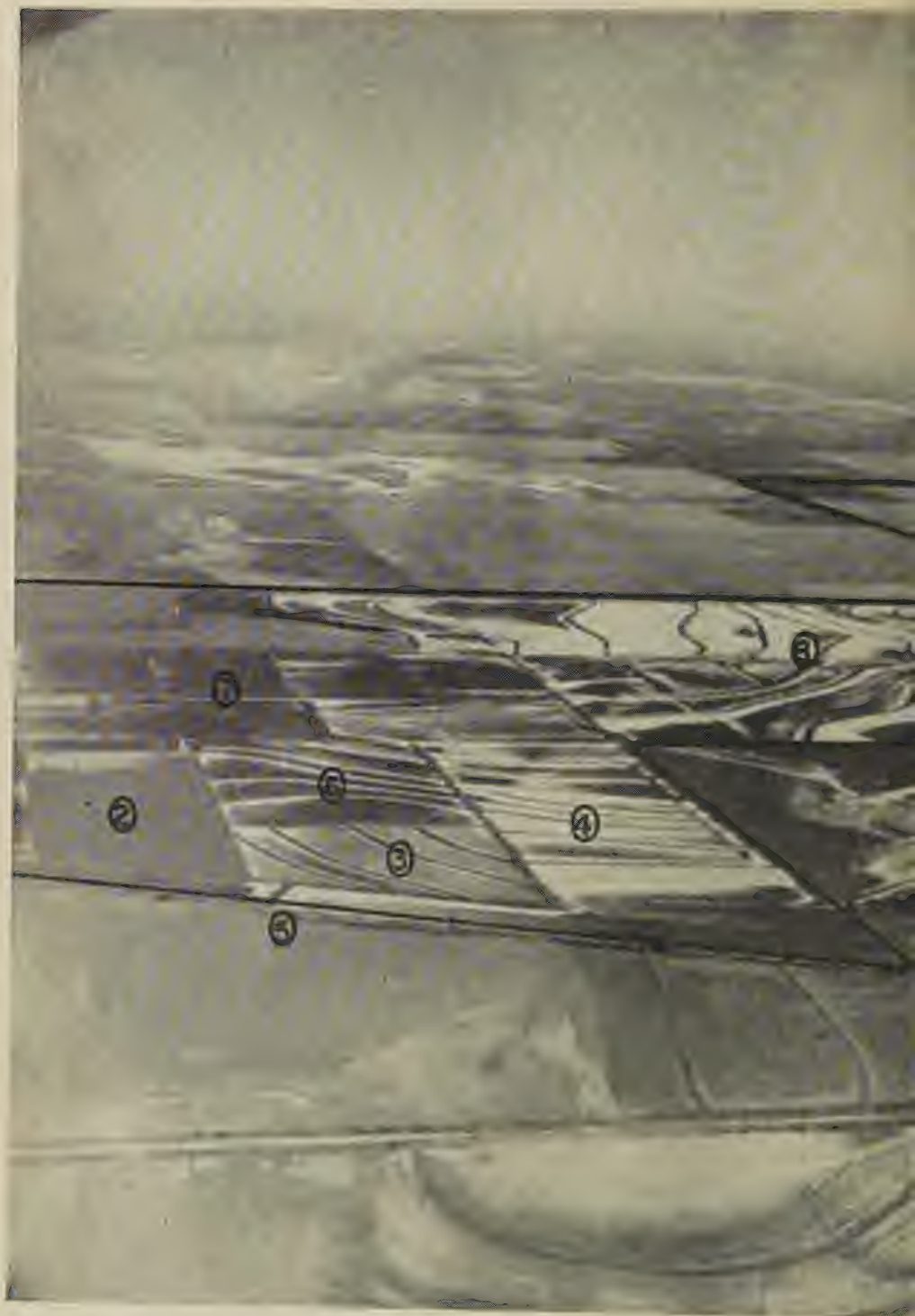


Figure 34. Aerial view of the Spur station with 200 acres of cultivated land co
for the significance of the numbers on the picture, and see Figure 30



Water after a 2.54-inch rain June 19-21. Refer to "No Kromica for 20 Years"
chum silage yields the following November.

Area No. 2, shown in the foreground, has had cotton planted in rows running with the slope for 20 years. The land slope is only 6 inches in 100 feet, the slope generally terraced 20 years ago. The average annual runoff has been 2.75 inches and the average yield of cotton has been 119 pounds per acre. Area No. 3 has closed level terraces and there has been no runoff during the 20-year period. The average yield of lint cotton has been 175 pounds per acre, or a 47 percent increase over the area having rows with the slope.

On a dollar-and-cent basis with the prevailing price of cotton each year during the 20-year period, the acre return from lint alone was \$419.09 from the area having rows with the slope and \$605.50 per acre from the area having closed level terraces. This represents an increase of \$191.41 per acre or \$9.57 per acre per year. An acre foot of water saved gave a return of \$41.76.

Of more importance to many is that not a particle of soil was lost during the 20 years through erosion from the area having closed level terraces. While soil losses from the area having rows with the slope could not be measured with the equipment available, other experiments at the Spur station on similar land planted to cotton had a loss of 1,369 tons of soil per acre with each inch of runoff. This leads to the conclusion that the 55.01 inches of water lost carried with it 75 tons of soil per acre over the 20-year period from straight-row farming on land with 0.5 percent slope.



Figure 35. This area was under water June 19, 20 and 21, 1946, as shown in Figure 34. The water was then drained off and the sorghum crop planted the first week of July and cut the second week in November. Silage yield from this area harvested the first week in November was 12.12 tons per acre.

Carotene Studies with Fattening Steers

The carotene content of forages used in feeding is a controlling factor in the carotene and vitamin A content of the liver and the carotene content of beef fat.

Steers from good native or wheat pasturage may be expected to

show yellow-tinged to yellow fat. The yellow color in fat seems to be caused largely by the carotene content of the fat. Fats showing .80 ppm. (parts per million) pure carotene may be expected to show undesirable (to the beef trade) yellow color. Fat from steers depleted of vitamin A reserves to the point of showing night blindness contains only about .25 ppm. pure carotene. Beef fat of such carotene content is visually rated as very white.

Yearling Hereford steers fed in dry lot at the Spur station for



Figure 36. Hereford (upper) and Jersey steers (lower) fattened in dry lot at the Spur station. These 2 breeds fed similarly on both high and low dry lot levels of carotene were not significantly different for liver or fat carotene, or vitamin A in liver. However, color ratings indicated greater tendency to yellow color of fat for Jerseys than for Herefords, although one Jersey, which was night blind, showed white fat.

about four months on farm roughages such as sumac silage showed from .30 to .60 ppm. pure carotene in fat, and their fat color ranged from light cream to white. Jersey steers fed in the same manner showed almost the same values for carotene in fat as the Herefords, but color ratings indicated a greater tendency to yellow-colored fat for the Jerseys. See Figure 36.

As compared with green pasturage, roughages which may be fed in dry lot provide low intakes of carotene. The maximum storage of vitamin A in liver, carotene in liver and carotene in fat for Hereford yearling steers from wheat pasturage is indicated as about 350 ppm., 20 ppm., and 2.3 ppm., respectively. Severely depleted, or night blind steers show approximate values of 1.0 ppm., .50 ppm., and .25 ppm., respectively.

Feather Coloring of Bronze Poult

Turkey poult receiving starter rations containing a high percentage of vegetable proteins without any animal proteins, developed primary and secondary wing feathers that were discolored when first grown. An investigation by the Station showed that this condition can be changed by the addition to the ration of animal proteins rich in the amino acid lysine. The new feathers coming out after the addition of lysine were of normal color regardless of the maturity of the bird. This is not in agreement with the idea that normal colored feathers are always grown at the termination of the body growth.

Sometimes, however, at ages when body growth is slow, feather color may be more satisfactory even on slightly deficient diets than at ages when birds grow rapidly. Carefully planned rations should prevent the appearance of white feathers altogether.

In feeding both grain and mash, care should be taken that the birds do not eat so much grain in proportion to mash that the intake of lysine-rich proteins, which are found in the mash, are too low.

Downy Mildew-resistant Cantaloupe

A new cantaloupe with high downy mildew resistance has been developed at the Weslaco station. It has an interesting history as to parentage. Its ancient maternal parent was a small orange-yellow wild melon of cucumber-like quality with considerable resistance to mildew. This was crossed with Hale's Best and the first generation hybrid then crossed with Smith's Perfect. The new type has resulted from many generations of controlled pollination. See Figures 37 and 38.

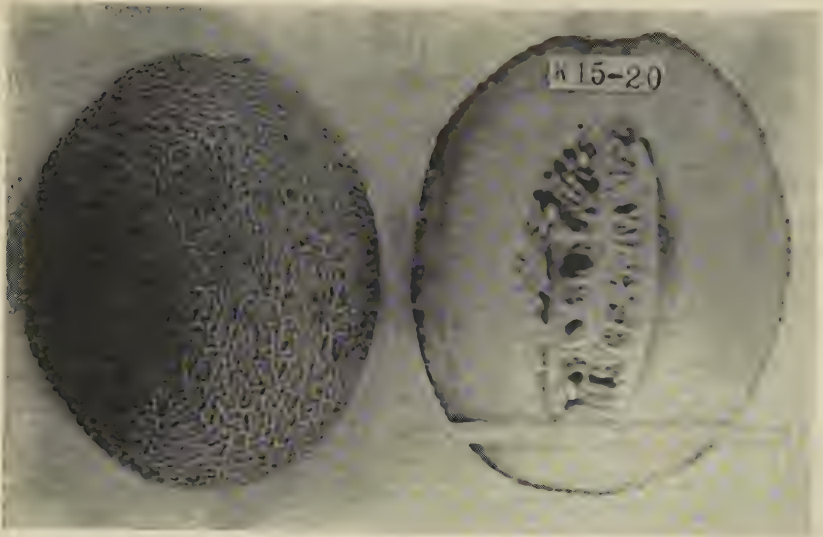


Figure 37. A new downy mildew resistant cantaloupe developed at the Weslaco station, tentatively called K-15. It is remarkably sweet and delicate in flavor.

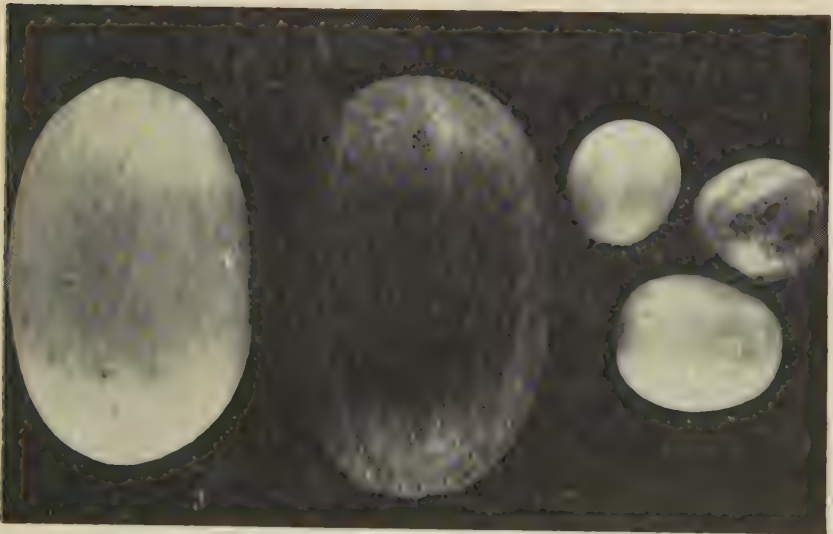


Figure 38. A step in the development of K-15, a new downy mildew-resistant cantaloupe. *Right*, three fruits of the wild so-called smell melon, scarcely two inches long, one of the original parents; *left*, the first generation hybrid fruit, derived from the cross between the smell melon and the Hales Best cantaloupe.

It has remarkable flavor and sweetness, and deep flesh, bright orange flesh color, good form and complete netting. It is not quite as good in fruit set as some varieties, but work is under way to improve it in that respect. Foundation seed stocks will be developed in the spring of 1947.

This melon should play an important part in the development of a cantaloupe industry for South Texas, where the earliest shipments of the nation are possible.

Green Legume Grazing During Winter

December, January, and February are critical months for East Texas pastures as no green grazing is ordinarily available. Clovers will furnish early spring grazing, but supplemental pastures of small grains have been the only satisfactory bridge between fall grass and the spring clovers.

Several years ago it was noted that narrow leaf vetch (*Vicia angustifolia*) grew wild in fence rows, roadsides, and some pasture areas. It was started on larger areas of the Tyler station pastures and on upland hay meadows, where it has maintained itself and multiplied by volunteer crops. One important characteristic is that it will furnish very palatable grazing from Nov. 15 or Dec. 1 to March in proportion to the density of the stand, the fertility of the soil and the climatic conditions. Its response to climatic conditions is comparable to that of oats. It responds well to phosphate fertilizer, but is more tolerant of soil acidity than some of the other vetches, notably *V. leavenworthii*, and the *Medicago* clovers.

When used in pastures and meadows, narrow leaf vetch has not only furnished grazing in itself, but has also increased the quantity and apparently the quality of the grasses that succeed it. When used as a soil improving crop on cultivated land, it has been inferior to hairy vetch. In association with grasses it has been better than hairy vetch.

Difficulty of seed harvest has prevented a wider spread. The seed shatter on maturity and must be harvested and threshed within a few days. As much as 100 pounds of seed per acre have been harvested under very favorable conditions, and enough seed was left on the ground for a heavy volunteer crop.

Continuous grazing of pastures has not prevented several successive volunteer crops. This has been attributed to the fact that as narrow leaf vetch approaches maturity, during the latter part of April and early May, there are sufficient grasses and clovers in a more palatable state to satisfy the cattle.

Sprays Useful in Controlling Weeds

The Weslaco station is using 2,4-D in an experiment to control four species of perennial vines which infest citrus trees, and for the control of other aquatic plants which infest drainage ditches.

This station has found 2,4-D in the form of sodium salt, the methyl ester or the butyl ester, to be effective against a wide variety of troublesome weeds when used at concentrations ranging between 0.2 and 0.3 percent technical 2,4-D. Care should be exercised in the use of 2,4-D as many cultivated plants are also seriously affected.

Naptha, stove oil and kerosene were very effective at Weslaco in controlling young weeds and grass when applied as a pre-emergence spray on corn, potatoes, onions and carrots. Low flash naptha and stove oil proved to be highly effective as selective sprays for freeing young carrots of weeds.

Hay and Grain Drying

A wooden, farm-size grain dryer was designed, built and tested during 1945 by agricultural engineers of the Texas A&M College.

The tests proved so favorable that in 1946 the Consolidated Steel Company, Orange, Texas, built an all-steel unit patterned after the wooden dryer and gave it to the College, Figure 39. This unit was demonstrated and tested near Driscoll. It is capable of drying

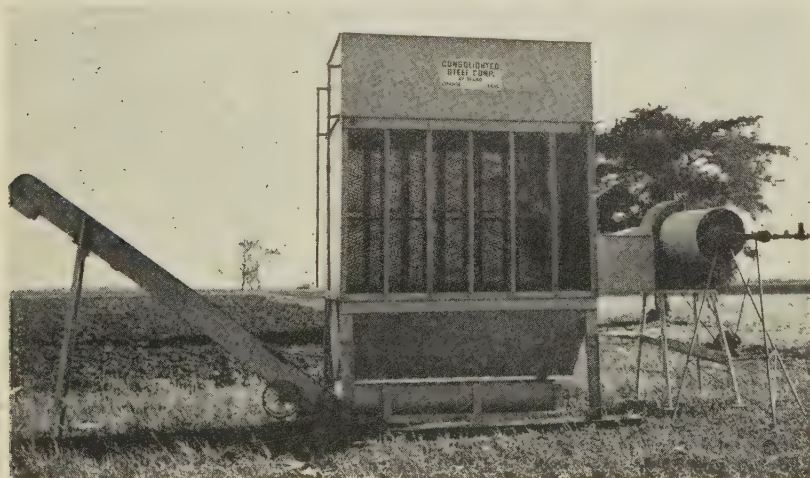


Figure 39. All-steel dryer built by Consolidated Steel Corporation, Orange, and given to the A&M College of Texas.

approximately 4,200 pounds of grain an hour, reducing the moisture content from 20 percent to less than 14 percent at a cost of 30 to 34 cents a ton.

Early in 1946, a 30 x 60-foot half-round barn was built on one of the College farms to install an experimental barn hay-finisher, with the conventional lateral system on one side of the barn and a sub-floor system on the other, Figures 40 and 41.

The lateral system is similar in design to the conventional lateral type barn hay-finisher. However, one-half the unit is provided with wire laterals made of 1 x 1-inch steel wire mesh while the other half is provided with wooden laterals. A Buffalo No. 5 centrifugal fan driven by a 5 horsepower electric motor is used to force air through the ducts and hay.

The sub-floor system consists of a main duct along one side of the barn with a 6-inch opening along the bottom of the duct and extending the entire length of the barn to allow air to move under a sub-floor and in turn through the hay. This unit is built with two types of floors with 2 x 6-inch joists used for both. One-half the floor area is covered with 1 x 2-inch wooden strips with 2-inch openings separating the strips, while the other half is covered with 1 x 1-inch steel wire mesh. The floors are built in sections so that they can be easily removed for cleaning or storing away at the end of the season.



Figure 40. Lateral type barn "hay-finisher" installed on one of the Station farms near College Station. Note the two types of lateral ducts—wood at far end and steel wire mesh at near end.



Figure 41. Sub-floor barn "hay-finisher" installed on one of the Station farms. Steel wire mesh floor at near end and 1 x 2-inch wooden slats at far end.

Because of the shortage of equipment the sub-floor system was not operated in 1946. It is planned to have both units in operation in 1947 and to obtain comparative results on the operation of the different systems.

The lateral system was completed during the last part of the haying season. Two batches of fourth cutting alfalfa hay were dried. The first batch was unbaled hay and the second was baled hay. The wire laterals proved very satisfactory in both cases. It was observed that the hay dried more uniformly with the wire laterals than with the wooden laterals, and, consequently, at a faster rate. The hay between the wooden laterals was completely dry at the end of the drying period while that over the top was still damp.

Other crops that were dried by the Station with this system were cowpeas, Dallis grass seed, Johnson grass seed and ear corn.

Wool-growth Tests

Wide variations both in staple length and scoured fleece weight produced by prospective stud Rambouillet rams have been revealed in a study which has been underway for several years at the Sonora station, Figure 42. Ten to 15 top ram lambs have been machine shorn at weaning time and fed a balanced growing ration for approximately 12 months.

In the 1945-46 test, which extended only 339 days, the heaviest of 14 unscoured fleeces weighed 23.3 pounds and the lightest



Figure 42. Showing type of Rambouillet rams used in wool-growth tests at the Sonora station.

weighed 13.5 pounds. The staple length of the heavier fleece averaged 3.58 inches as compared with 3 inches for the lighter one. The 23.3-pound fleece after scouring weighed 10.2 pounds while the 13.5-pound fleece weighed 6 pounds after scouring.

This study has definitely indicated that greater emphasis should be placed upon performance in the selection of prospective stud rams. The "C" type yearling ram which produced a fleece weighing 10.2 pounds scoured weight during a growth period of 339 days was sired by a "C" type Rambouillet ram which produced a fleece weighing 10.4 pounds scoured basis during a 12-months growing period.

Summer Deferment of Pastures

The practice of continuous heavy grazing on the Edwards Plateau has resulted in almost complete disappearance of desirable bunch grasses which reproduce from seed only. Poisonous bitterweed (*Actinea odorata*) and other undesirable plants, profiting from the lack of competition from the overused grasses, have come in abundantly. A possible permanent solution to the problem is lighter stocking and a system of deferred or rotative grazing.

A deferred-grazing plan to determine vegetative trends was established on the Sonora station in 1941, and is in effect at the present time. Three small pastures, designated as A, F and H, were set aside to be rested each year from early May until late September. These pastures have not been grazed during the major

portion of the growing season for grasses, but have been used heavily during the bitterweed growth period.

A five-year average (1942-1946, inclusive) of the stocking rates of the pastures is given to show the grazing practices (one cow and one calf being one animal unit): all station pastures—15.7 acres per animal unit; Pasture A—10.5 acres per animal unit; Pasture F—8.8 acres per animal unit, and Pasture H—10.8 acres per animal unit.

It is obvious that the pastures rested in the summer support approximately 1.5 times more grazing per acre on a yearlong basis than does the average pasture which is grazed yearlong. See Figure 43. Despite this heavier usage, Pastures A, F and H are in all instances showing a very noticeable decrease in poisonous bitterweed and a marked increase in the valuable bunch grasses, some of which are side oats grama (*Bouteloua curtipendula*), hairy grama (*B. hirsuta*), feather bluestem (*Andropogon barbinodis*), and fall witch grass (*Leptoloma cognatum*).

These data indicate clearly that overgrazing during the spring and summer growing season is much more harmful to the range-land than is heavy winter use. It must not be assumed, however, that range land will stand unlimited winter grazing. Overuse removes all grass litter, thus exposing the bare soil to severe erosion in case of heavy rains, and to severe drying in case of a long dry period following overuse. In the latter case plants already weakened by close grazing are likely to die from drouth. Such a condition was observed in Pasture F in the spring of 1946.



Figure 43. Left of fenceline is Pasture D, grazed yearlong. The vegetative cover is a solid stand of bitterweed. On right is Pasture H, rested in summer. The vegetative cover is grass.

Crotalaria for East Texas

The ordinary late variety of crotalaria (*Crotalaria spectabilis*) is the best soil-building legume that has been used for adding humus to the worn-out deep sandy fields at the Jacksonville laboratory in the past eight years. See Figure 44. It produced much more green matter per acre than Austrian winter peas, hairy vetch or Abruzzi rye. In 1946, crotalaria produced 18 tons of green matter per acre. The early variety grows about four feet tall and ripens its seed in August. It produced much less humus per acre than the late variety that grows five to eight feet tall and ripens its seed in November.

Crotalaria roots are practically immune to root-knot nematodes that damage most other kinds of farm crops. The nematodes starve and decrease significantly in fields of crotalaria especially when weeds are controlled and the legume occupies the land from April to December. Starving out the nematodes makes the land more profitable for growing cash crops later. Livestock should not eat crotalaria as it is slightly poisonous. The seed is poisonous to chickens, and rats will not eat it.

Crotalaria seed should be scarified, inoculated with Notragin E, and planted in moist soil early in March. It grows well without the aid of commercial fertilizers, but produces more humus with



Figure 44. *Crotalaria spectabilis* plants grown at the Jacksonville laboratory. This legume is immune to the root-knot nematode. Used as a cover crop, it also supplies large quantities of organic matter and nitrogen to worn-out soils.

the help of superphosphate or complete fertilizer. It is profitable to put about 200 pounds of fertilizer per acre into crotalaria fields. Although crotalaria may be plowed into the soil in August to prepare land for fall crops, more humus is added by waiting until December and plowing the field before a freeze kills the leaves, which are very resistant to moderate frosts. The stems rot rapidly in damp soil and are practically decayed by March in time for early spring crops. Tomatoes and other crops grow well after crotalaria.

If many of the crotalaria stems are killed by charcoal rot, corn should not be the next crop in rotation, as it is also very susceptible to this common disease. However, fertilizer and cultivation help crops to resist charcoal rot, especially when they are aided by summer rains. Cool-weather spring crops such as tomatoes, resistant crops such as cotton, and resistant varieties of sorghum are preferred in rotation after crotalaria.

Fertilizer Tests in the El Paso Valley

Cotton fertilizer tests have been conducted at the Ysleta station since it was established in 1942. The lighter and less productive soils have responded well to phosphate and nitrogen.

No increase in yield has been obtained from the addition of potash. Returns, above cost of fertilizer, as high as \$36.73 per acre, have resulted where a mixture of 294 pounds of double superphosphate and 204 pounds of ammonium nitrate were applied as a side dressing during June.

The highest returns per dollar spent for fertilizer were obtained from the application of 189 pounds of double superphosphate and 66 pounds of ammonium nitrate. This gave a return, above cost of fertilizer, of \$33.16 per acre.

Control of Lemon Stem-end Rot

Losses due to *Diplodia* stem-end rot have occasionally been serious in lemons shipped in summer and fall from the Lower Rio Grande Valley. Methods of treatment developed at the Weslaco station have reduced these losses to negligible proportions so that in the last years of the war the lemons brought ceiling prices throughout the season.

Treatment consists of a one-minute dip in ethyl mercurithio-salicylate at a 1 to 10,000 dilution. Recently this treatment has been improved upon by also giving lemons the nitrogen trichloride

gas treatment (Dekko process) in the coloring room. Either treatment reduces decay by 85 to 98 percent. Repeated tests show the two together reduce decay by 99½ percent, while regular packs without treatment showed 50 to 75 percent decay.

Vitamins in Meat After Stewing

Stewing remains one of the most widely used methods of meat cookery. The process of stewing meat varies considerably in different sections of the United States. Light stews (meat not seared) are preferred in some places and brown stews (meat seared) in others. In certain sections, enough water is used to cover the meat completely and it is served separately. In others, only the smallest possible amount of water is used and it is served with the meat. Such marked prejudices are held on the proper method of stewing that investigation of these variations seemed important.

The temperature used in stewing meat also varies. A "simmering" temperature has long been recommended for stewing. Practically, however, a boiling temperature is much easier to maintain during the two or three hours needed to make the meat tender. The recently introduced pressure saucepan has made possible short cooking periods, and pressured stews have become important.

A study of beef and lamb stews by the Station was designed to show which of these variables causes the greatest retention of thia-

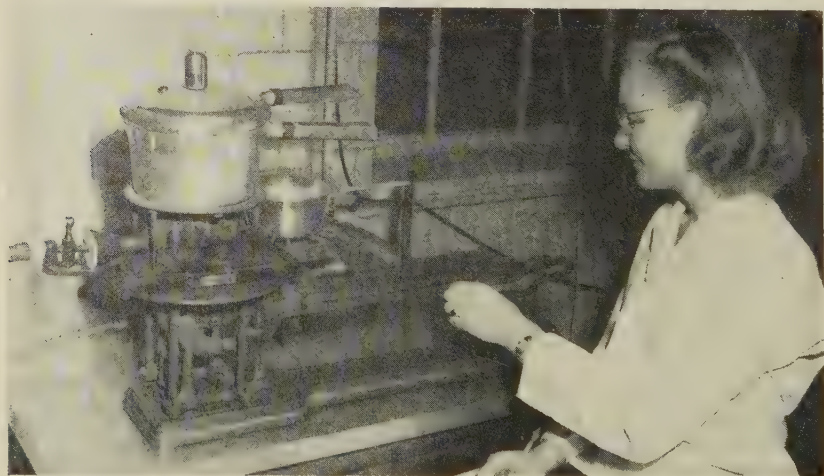


Figure 45. Method for keeping a constant amount of water in the boiled stews. Cooking utensil and gas hot plate are placed on a balance. Small quantities of boiling water are added to keep the weight within a certain range.

mine, riboflavin, pantothenic acid and niacin. Stewing of comparable samples of meat was carried out according to various cooking procedures: seared and not seared, large and small amounts of water, and temperatures of simmering, boiling and 250°F (15 pounds pressure). See Figure 45.

About 20 percent of the original thiamine (B_1) was destroyed during stewing. Searing was the only one of the procedures which changed the total retention of thiamine. The light stews contained approximately one-fifth more thiamine than the brown stews. A serving of meat stew may contain about 10 to 14 percent of the daily thiamine allowance.

About 25 percent of the original pantothenic acid was destroyed during cooking. None of the cooking procedures affected the total retention of pantothenic acid. But the distribution of the pantothenic acid between meat and broth was affected by the quantity of water used in stewing. When the amount of water was sufficient to cover the meat, the vitamin was about equally divided between the meat and the broth. When the smaller amount of water was used, the total vitamin content of the cooked stew was about 40 percent in the broth and 60 percent in the meat.

None of the niacin was lost during stewing. However, the distribution of niacin between meat and broth was affected by the quantity of water used in stewing. When the amount of water was sufficient to cover the meat, less than half the niacin was in the meat and more than half of it was in the broth. On the other hand, when a small amount of water was used for cooking, about two-thirds of it was in the meat and about one-third was in the broth. A serving of meat stew furnishes about one-third of the daily allowance of niacin. If the stew has been cooked in enough water to cover the meat, a little more than one-sixth of the recommended daily allowance of niacin is in the broth.

None of the riboflavin (B_2) was lost during stewing. However, the distribution of riboflavin between meat and broth was affected by the quantity of water used in stewing. While more of this vitamin was found in the meat than in the broth regardless of the amount of water used in cooking, yet the larger amount of liquid extracted more of the vitamin. A serving of meat stew furnishes 10 to 15 percent of the daily allowance of riboflavin. When stews were cooked in enough water to cover the meat, not quite half of the riboflavin was in the broth.

For the highest vitamin retention in meat stews it is, therefore, advisable to conserve all of the broth.

Protecting Tomatoes from Nailhead Rust

Copper sprays used in 1946 at the Jacksonville laboratory on a field of tomatoes that had an epidemic of nailhead rust, nearly



Figure 46. Nailhead rust on green tomatoes. This destructive bacterial disease can be successfully controlled by proper and timely spraying or dusting with a copper fungicide.

doubled the yield of marketable fruit over that of other fields similarly infested where these sprays were not used. See Figure 46.

Nailhead rust (bacterial spot) disease is caused by bacteria that damage or destroy many tomato crops in rainy weather in East Texas. The bacteria make spots in the epidermis of the stems, leaves and fruits. Rain splatters the bacteria from diseased spots to healthy tissues that soon become infected and show spots within a week or two. Tomatoes are unlikely to be very profitable unless they are protected from this disease.

Copper chemicals in sprays or dusts are used very profitably at the Jacksonville laboratory to prevent damage by nailhead rust. The copper poisons the water on the plants so that the bacteria cannot infect them. It is impractical to try to cure sick plants; therefore, a regular schedule of spraying or dusting tomatoes is followed to prevent nailhead rust, early blight and Septoria blight from becoming abundant in fields. Lead arsenate or calcium arsenate is mixed with the copper chemicals in the sprays or dusts to control worms on the plants until the earliest fruits are two inches in diameter. The pests are controlled more profitably when the tomatoes are sprayed or dusted once in the hot bed, twice in the cold frame, and once a week in the field until the middle of the picking season.

Supplying Phosphorus to Range Cattle

In a five-year experiment, July, 1941 to November, 1946, on the King Ranch in Brooks county, the most consistent and uniformly good results for four calf crops were obtained with 43 cows which were supplied approximately 6.5 grams of phosphorus daily per head through the use of disodium phosphate in a controlled water supply. These cows, grazing a 640-acre pasture, produced 137 pounds of weaned calf weight per acre, bore a high percentage calf crop each year, and remained in uniformly excellent condition through the experiment.

The check group of 43 cows on a 640-acre pasture without supplementary phosphorus, produced 88 pounds of weaned calf weight per acre during the experiment, Figure 47. These cows failed to obtain maximum development and produced fewer and lighter calves than did the cows supplied phosphorus. Although the plan of the experiment was to wean the calves at 8 months, several cows in this group died because of "creeps" and it became necessary to wean calves in this pasture at earlier ages.

Forty-three cows, also on a 640-acre pasture and supplied with



Figure 47. Control cattle on the King Ranch in an experiment to determine practicable methods of supplying phosphorus to range cattle. Average weight of these cattle (which did not receive a phosphorus supplement) when the above picture was taken, Sept. 23, 1944, was 858 pounds. See Figure 48.

bone meal in self-feeders, produced 131 pounds of weaned calf weight per acre. Some cows in this pasture did not consume enough bone meal when nursing calves to maintain normal values of blood phosphorus; however, as a group, the cows adjusted their consump-



Figure 48. These cows grazed a pasture on the King Ranch which had been fertilized with 200 pounds of triple superphosphate per acre. Average weight of these cattle was 1,062 pounds when the above picture was taken, Sept. 23, 1944. Compare with Figure 47.

tion of bone meal to their needs reasonably well. Larger amounts of bone meal were eaten during periods of drouth and in winter when the grazing consisted of dry grass.

Sixty-three cows on a 640-acre pasture fertilized at the outset with 200 pounds of triple superphosphate per acre, produced 196 pounds weaned calf weight per acre, Figure 48. During the first four years, this group of cows remained in excellent condition and produced the highest percentage calf crop of any group. Before 1946 there was no indication of overstocking, nor were there any symptoms of "creeps" in this pasture. In 1946, with extreme drouth, there was practically no growth of fresh grass and the blood phosphorus of the cows with calves reached about the same low level as that of the cows in the check group.

Under the conditions of this experiment it has been shown that supplying phosphorus to range cows by a soluble phosphate in a controlled water supply, by self-feeders using either bone meal or disodium phosphate, or by pasture fertilization with superphosphate is economically sound as measured by the production of weaned calf weight per acre, the prevention of "creeps" and the higher fertility, greater scale and better condition for the cows.

Loose Smut of Wheat

Loose smut (sometimes called head smut or blast) causes an annual loss estimated at 360,000 bushels of wheat in Texas. This disease is caused by a fungus (*Ustilago tritici* (Pers.) Rostr.) whose spores are carried by the wind to normal heads of wheat during flowering where they infect the young ovary of the seed. Because the fungus is within the mature seed, it cannot be controlled by the usual seed disinfectants. The disease can be controlled by an elaborate hot water treatment of the seed; but the most practical method of control is through the use of resistant varieties.

Since 1937, more than 250 varieties and strains of hard and soft winter wheat have been tested at the Denton station for resistance to loose smut by artificially inoculating the seed with the disease. These tests show that, with one exception, all commercial varieties grown in the State are highly susceptible to the disease. Austin wheat is resistant to loose smut and to rust, Figure 49.

Breeding work is in progress to study the manner of inheritance of resistance to loose smut and to incorporate the resistance of Austin and other varieties into new rust and smut resistant varieties adapted to all sections of Texas where wheat is grown.



Figure 49. Showing (left) a normal plant of Austin wheat, resistant to loose smut, in comparison with a susceptible variety in which all heads of the plant have been destroyed by smut.

Corn Hybrids

Each year since 1943 the acreage planted to corn hybrids in Texas has doubled, so that in 1946 hybrids occupied 20 percent of the acreage devoted to corn production. It is estimated that the hybrids now in use in Texas are producing an average of 23 percent better yields than the same land would produce if planted to the best open-pollinated varieties. See Figure 50.



Figure 50. A Texas hybrid corn field. Contrast with the field shown in Figure 29.

Although hybrids have shown up well over a period of several years, they have certain restrictions as to their regions of adaptation. For the Blacklands, Texas Hybrids No. 8 and 18 have been consistently good. No. 12 has been best on soil with plenty of moisture, as at Tyler and in bottom lands near College Station. Although No. 12 seems to suffer severely from drouth, it has often been among the best yielders in the Grand Prairie and in the Rolling Plains regions. Texas Hybrid No. 20 is relatively new

and its adaptation is not well known, but it seems to have a wider adaptation than No. 18. All of these hybrids are yellow corns.

Only one white hybrid is now in production in the State. This is Texas Hybrid No. 9-W. It has given good results in the Blacklands, in East Texas, in the Lower Rio Grande Valley, on the Gulf Coast and in bottom lands of East Central Texas.

Holt, A New Fall Peach

A new yellow freestone peach, the Holt, looks very promising for fall marketing, Figure 51. It is a chance seedling which came up in the cowlot of Dan Holt of Montague, and was transplanted to his yard. In the spring prior to the death of the original tree in 1941, nursery trees at the Montague laboratory were propagated with buds from this variety.

The fruit ripens the second week in September when there is no other variety of commercial importance as a competitor. Usually, fall rains set in before the fruits begin to mature and good-sized, uniform peaches are produced. The Holt peach attains an attractive red color over a yellow background about two weeks before becoming fully ripe. Because of this condition and also since temperatures are not as high as for mid-season varieties, it can be harvested over a longer period.

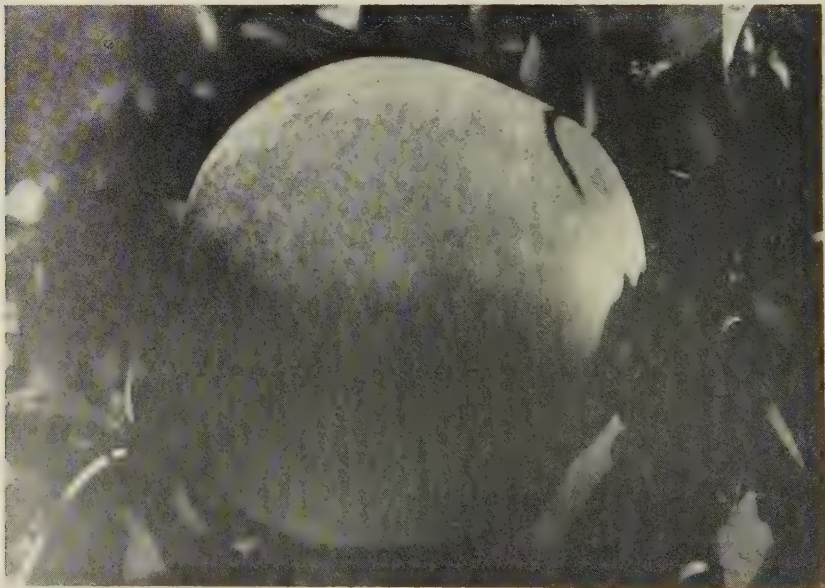


Figure 51. The Holt peach has color, size and commercial quality.

Other desirable features are its exceptionally small seed and firm, yet melting flesh. Fruits are round-oval, bulged at one side with unequal halves. The flesh is yellow streaked with red, subacid and slightly coarse. It promises to be an excellent peach for distant shipping since it has a firm texture.

Possibilities for Safflower Production

Safflower, a plant belonging to the thistle family, might become a crop of interest to Texas farmers in case a reduction in the acreage of cotton, wheat, or grain sorghums occurs in the future. The crop produces seeds containing a desirable edible or paint oil. The processed cake or meal contains about 25 percent protein and is relished by cattle.

The crop is produced and harvested with wheat machinery. Average yields of 800 to 1,200 pounds per acre appear, from trials at the Chillicothe station, to be possible in some of the drier areas of the State.

The crop will not withstand winter temperatures in the areas where it will thrive, but planting may be done as early in the spring as possible, usually late January or early February. A *Septoria* leaf-spot disease is the chief hazard to production and will prevent the use of the crop in the more humid areas of the State. See Figure 52.



Figure 52. Safflower just before maturity at the Chillicothe station.

Wire and Fence Exposure Tests

The Station was one of 11 locations in the United States at which 10-year wire and fence exposure tests have been conducted by manufacturers of these products. The Station erected 228 samples of wire and fence at College Station in 1936, Figure 53.

The materials on test consist of 72 samples of farm field fencing, 23 samples of barbed wire, 13 samples of wire strand and 120 samples of unfabricated wire. The farm field fencing include uncoated copper-bearing steel, zinc-coated copper-bearing steel, corrosive-resistant steel, copper-covered steel and lead-coated steel.

The weight of the zinc coating varied from .20 to 1.8 ounces per square foot of uncoated wire surface. The base metal of the bare and zinc-coated barbed wire samples is the same as for the farm field fence, or copper-bearing steel. Unfabricated wire samples have the same materials as the farm field fencing, but in addition to these materials, bare wire made of non-copper-bearing metal are included in the samples.

An inspection of the unfabricated samples after nine years of exposure at College Station showed:

Uncoated or bare steel wire became 100 percent rusted immediately after erection.

Samples having .20 to .25 ounces of zinc coating per square foot of area show approximately 20 percent rusted, and a total of 55 percent of the areas rusted and yellow.

Samples having .25 to .35 ounces of zinc-coating have approximately 8 percent rust, and a total of 50 percent of the surface rusted and yellow.

All samples having more than .35 ounces of zinc-coating per square foot of area show less than 1 percent of rust. Samples having more than 1 ounce of zinc-coating show no corrosion.



Figure 53. Plot at College Station on which wire and fence exposure tests were conducted.

Corrosive resistant 18-8 stainless steel shows no signs of corrosion. Both the cold-drawn and air-quenched chromium samples show deterioration.

Sufficient information has been obtained from all the 11 locations to enable the manufacturer to write specifications for the amount of zinc-coating needed for a fence of a certain length of life for different locations. Industrial and sea-coast exposures require heavier coatings than do rural and mountain exposures.

Urinary Calculi in Fattening Steers

The Station has cooperated in steer feeding and finishing tests with the U. S. Dry Land Field Station at Big Spring in a study on the control or prevention of urinary calculi, Figure 54. This condition is quite common in bulls and steers in that area.

A series of feeding tests has indicated a higher incidence of calculi in feeding grain sorghum grains than in feeding corn. The most trouble with calculi has occurred when ground grain sorghum heads were used for fattening.

In four separate tests, the feeding of supplemental phosphorus contained in seven ounces of bone meal per head daily showed a lower incidence of calculi than groups fed limestone flour. In the 1946



Figure 54. This lot of steers fed an average ration consisting of 10.6 pounds ground threshed milo; 1.97 pounds cottonseed meal; 17 pounds sumac silage plus 7 ounces bone meal, 1945-46 test, during a 182-day fattening period, gained basis final market weights 2.08 pounds per head daily. All carcasses graded Choice.

trial, a group which received a similar amount of supplemental phosphorus in 52 cc. per head daily of phosphoric acid (75 percent strength) showed less calculi than the group receiving bone meal.

There is an increase in gain in feeding bone meal or limestone flour. But in feeding limestone flour there is an increase of calculi. The present information indicates bone meal is desirable as a supplement to fattening rations (Figure 54) in the Big Spring area.

Soil Fumigation Increases Tomato Yields

Soil treatment with D-D mixture at the Weslaco station 30 days prior to planting, gave slight but consistent increases in yield, and the increases could not be attributed to nematode control resulting from the soil application of D-D mixture.

The cost of the treatment is so great that it would probably not be practicable to use this method except on soil that is known to be heavily infested with parasitic organisms, or on land which is to be used in the production of very valuable crops.

Wool Scouring Plant Activities

A total of 277,000 pounds of wool samples, and 1,500 pounds of mohair were graded and scoured in the Texas A&M College Wool Scouring Plant during 1946, Figure 55. This was the largest vol-

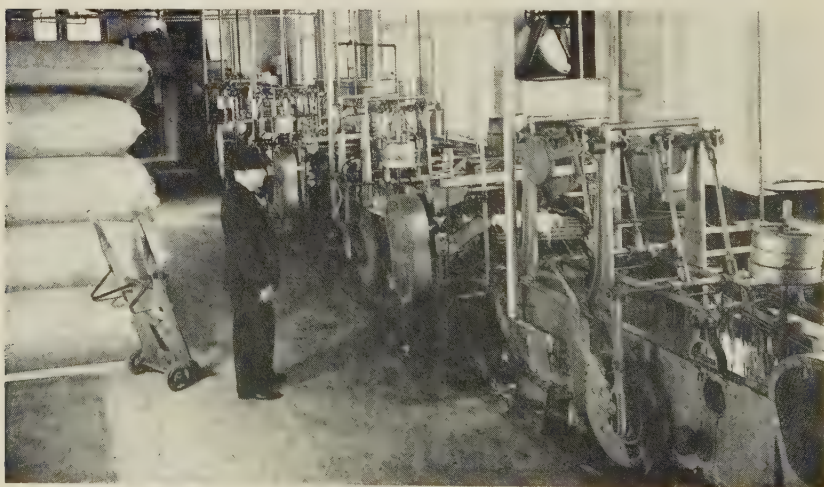


Figure 55. General view of the Texas A&M College Wool Scouring Plant where each fleece gets individual attention.

ume processed during any previous year, and was an increase of nearly 9 percent over the output for 1945.

Objectives of the plant are to conduct research on grades and shrinkages of Texas wool and mohair for producers, buyers and warehousemen. This affords an opportunity for all those interested in the Texas wool industry to obtain definite information on the commercial value of the many types of wool and mohair produced in the State. In addition to the work conducted along these commercial lines, the facilities of the plant are used in sheep and goat breeding programs in selection of stud animals. Texas A. and M. College agricultural students use the plant as their laboratory in wool studies.

"Break-even" Volume in Ginning

Over a 45-year period, ginning capacity in Texas has been continuously adjusted so that the total crop could have been ginned in 26 days of full 12-hour run. An extensive cost analysis by the Station over an 8-year period indicates clearly that ginning capacity is maintained at such a level that the average ginner breaks even in income and cost over a period of years.

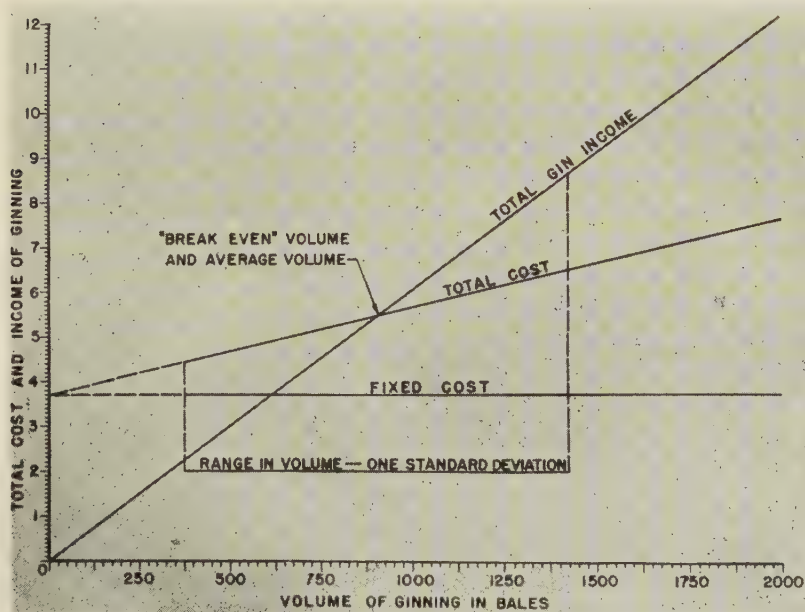


Figure 56. Relation of cost, income and volume of ginning of the average Texas gin. The cost and income curves bisect at about 900 bales, the average volume of Texas gins over a period of years.

A ginner may have a volume that alternates above and below break-even volume with shifts in cotton production from year to year. Ginners in areas of reduced cotton acreages, however, may find themselves with volumes consistently below that of break-even. In such instances, many of the gins are doomed as business concerns. Between 1932 and 1946, 1,711 or 37.4 percent of all Texas gins went out of business.

The basic nature of the ginning business as to cost, income, and volume of business is shown in Figure 56, which also illustrates the solid economic foundation of cooperative gins. Private gins are necessarily restricted to a break-even volume through the economic forces resulting from freedom of entry into the ginning business. The cooperative gin, on the other hand, may acquire and maintain a membership with a volume of business considerably beyond that of the break-even volume. Private gins in Texas are held to an average annual volume of about 900 bales; the cooperative gins of Texas have an average volume in excess of 2,000 bales.

New Broccoli Variety

Texas Early Green Sprouting broccoli is a new variety developed by the Station for superior quality and yielding ability under Texas conditions. It traces back to the selection of a single outstanding plant in 1938. The line was carried on by inbreeding superior single plants for the first few years, followed by mass selection during the past three years at the Winter Haven and Weslaco stations.

Figures 57 and 58 show the plant and head characters of Texas



Figure 57. Plant characters of Texas Early Green Sprouting broccoli.

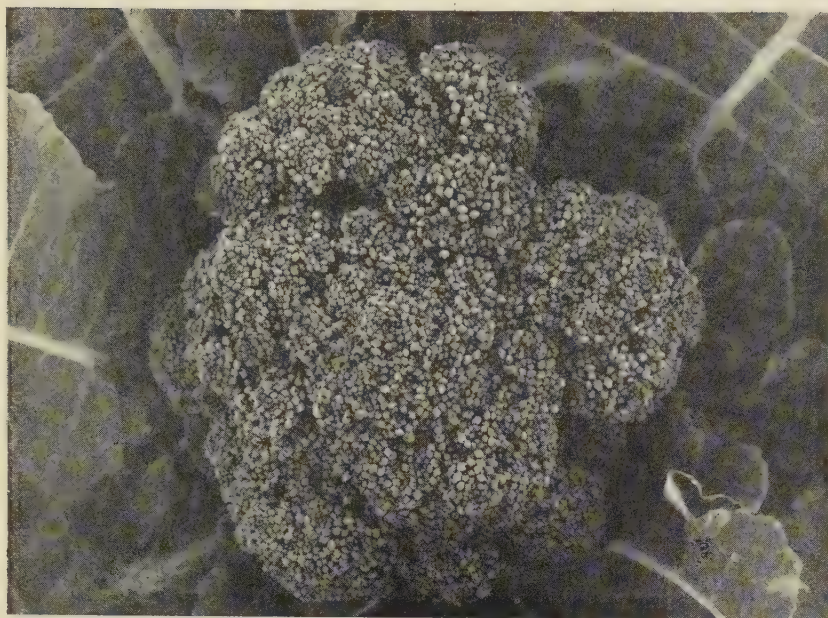


Figure 58. Head characters of Texas Early Green Sprouting broccoli.

Early. The plant is small, not as vigorous as those of the commercial strains now generally available, but it produces large, early heads of excellent quality and appearance. The heads of Texas Early were developed primarily as a productive, high quality market type, and are small-budded, firm, and compact. Texas Early has consistently given earlier and greater yields than the varieties and strains generally grown in Texas.

Seed of Texas Early Green Sprouting broccoli is being increased so that the new variety may be introduced to Texas growers at an early date.

Cotton and Corn Fertilizer Tests

The long-cultivated Lufkin soil at College Station responded readily to applications of fertilizer for cotton in 1945 and 1946, and for corn in 1946, Figure 59.

The yield of corn increased as the amount of nitrogen was increased up to 60 pounds per acre in the 12-8-8 fertilizer. This fertilizer made an average yield of 41.4 bushels per acre, an increase of 26.1 bushels over the yield of the plots which received the 0-8-8 fertilizer, and 31.4 bushels over the unfertilized plots. Twenty pounds of nitrogen per acre apparently was sufficient for the cotton.

The yield of both cotton and corn was increased as the amount of phosphoric acid was increased up to 40 pounds per acre. Increasing the phosphoric acid further did not result in additional increases of cotton or corn.

The soil responded to applications of potash. The yield of cotton and corn increased as the amount of potash was increased up to 60 pounds of potash per acre. The 8-8-12 fertilizer plots made an average yield of 265 pounds of lint cotton per acre, or an increase of 78 pounds over the yield of the plots which received the 8-8-0 fertilizer for the two years, 1945-46. The same fertilizer for corn produced yields of 27.9 and 34 bushels per acre, respectively.



Figure 59. Showing the response of corn plants to fertilizer. Left—growth of corn on unfertilized plots. Right—growth of corn on plots that received 500 pounds per acre of 8-8-16 fertilizer.

Wheat and Native Pasture Steer Gains

Good to Choice grade steer calves at the Amarillo station gained about 1.5 pounds daily per head from November to April on good wheat pasturage supplemented with sorghum bundles, Figure 60. Similar calves wintered on good native grass and fed two pounds of cottonseed cake daily averaged about one pound daily gain.

Steers wintered on wheat with sorghum bundles, summer grazed on native grass, then again pastured on wheat and fed a supplement of ground hegari bundles, returned carcasses of Good grade when slaughtered in April.

The average gain for steers so handled for 529 days, two winters



Figure 60. Calves on wheat pasturage at the Amarillo station always have access to either native grass or sorghum bundles. Wheat pasturage and ground grain sorghum bundles can be used in fattening yearlings and older cattle.

and one summer, was 793 pounds, or 1.5 pounds daily. Similar steers fed cake on native grass for two winters also summered as the steers on wheat made an average gain of 688 pounds, or 1.3 pounds daily.

Economic Characters in Cotton

The backcross progeny of four new trisomic plants were studied by the Station during 1946 for determination of linkage relationships of the five qualitative characters: red leaf color, okra leaf shape, brown line, smooth seed, and petal spot, all found in a synthetic line. Two new trisomic plants were studied involving the qualitative character virescent yellow leaf color; and one new trisomic plant was studied involving the three qualitative characters, green line, cluster fruiting, and round leaf shape.

Analysis of the 1946 data thus far indicates linkage in the study of lint color, petal spot, and leaf color, and that the genes for these characters may be found on the chromosomes of the trisomic plants under investigation this year.

Since the project was begun, 10 cases of linkage in cotton have been indicated, involving 19 trisomic plant types. Tests will be made in these cases in the usual manner to determine the degree of linkage between the several characters studied.

The results of these and future tests should prove of considerable value in establishing the linkage groups in cotton, as has been done

with corn and other grain crops. Such fundamental knowledge is essential to a well coordinated program of breeding and improvement dealing with the more important economic characters in cotton.

Rhodes Grass

Many open-pollinated selections of Rhodes grass which have been grown for several years were evaluated by the Station and reduced in number. An analysis was made of a plant-to-row test planting with each row containing 66 plants from one open-pollinated parent. Wide variability was shown to be present within each open-pollinated selection. It was not possible to determine a "type" from among the progeny. See Figure 61.

In order to obtain the desired characters in a stable line, some



Figure 61. Selection in Rhodes grass reveals a wide range of variability. New types appear regularly due to cross pollinating. The large leafy plant above represents a desirable type that is being developed.

inbreeding will be necessary. A number of the selections retained for further work were placed in isolation plots, while other selections were bagged to produce self-pollinated seed.

Clones of over 50 of the selections were planted at the Denton station in the spring of 1946. They have established themselves and will be subjected to the winter at that latitude to determine cold hardiness. When winter hardiness and leafiness have been stabilized in high yielding strains, those strains will be increased and distributed.

Kid Quality Mohair on Adult Goats

Angora goats grow coarser mohair with advancing age. The difference in diameter of fiber or quality between mohair from kids and from old goats is directly reflected in the prices paid for the mohair. This difference usually is at least 20 cents per pound in favor of the kid mohair.

Earlier investigations by the Station showed this definite relationship of diameter of fiber to age of animal. Many non-Angora goats have very fine fibers mixed with the outer hair coat. These fibers have the same basic structure as mohair; however, they are extremely fine even on old goats. The quantity of this fine undercoat is so small as to preclude any direct commercial use, however. The genes responsible for this extreme fineness of fiber on adult goats are being transferred to Angoras by crossing. The inherited genes for density, length of staple and relative freedom from kemp are being brought back by back-crossing selected crossbreds to Angoras.

The Station now has a few adult goats which produce kid mohair. This is commercially valuable mohair even though more breeding and selection are needed before animals are good enough to be used other than experimentally.

Fattening Steers in the El Paso Valley

Steers at the Ysleta station (Figure 62) fed cottonseed hulls to replace a portion of alfalfa hay, ate about two pounds more feed daily per head than steers receiving alfalfa as the only roughage. They also made the most gain, the highest yield, and had a slight advantage in carcass grade.

In rations of alfalfa hay and milo grain, 43 percent protein cottonseed meal had the advantage over 28 percent whole pressed cottonseed cake in the production of gain, yield, finish and net return.

The lot not supplemented with either cottonseed meal or whole pressed cottonseed cake made slightly less gain than any other lot.



Figure 62. Feeding arrangement for steers at the El Paso Valley Station.

Tomatoes for the West Cross Timbers

A cross was made in 1942 at the Stephenville station between Stokesdale and the small-fruited Porter tomato with the hope of increasing the size of the Porter while retaining its productiveness during the late summer.

One selection has been made that looks promising as the fruits resemble the Porter rather closely. They are, however, somewhat larger, being intermediate in size between the parent varieties. The vines are extremely vigorous and productive. The fruits are smooth, free from cracks, and will remain firm for several days after ripening.

Before releasing this selection for general distribution, seed will be distributed to a limited number of selected growers for further testing in 1947.

Combine Harvesting of Peanuts

In keeping with the trend toward mechanization in all lines of agricultural production, the Stephenville station has adapted a grain combine to peanut harvesting, Figure 63. The peanuts are picked up from windrows, thus saving much time and labor in harvesting and threshing. The hay may be allowed to fall to the

ground, or, if needed for livestock feed, it can be caught on a slide and dumped at the turnrow for baling. This machine turns out grades of threshed peanuts comparable to those obtained with conventional stationary threshers and pickers.

The major changes made in this machine consisted in slowing its operation to about 420 revolutions per minute; installing a spring tooth cylinder and putting adjustable spring teeth in the concave; replacing the beater with another spring tooth cylinder and using the finger grates as the concave. Adjustable spring teeth were passed up through the finger grate concave, and the grain screens were replaced with screens similar to those used in stationary peanut threshers. Minor changes were made in the augers and elevators to lessen the breakage of nuts.

This combine is powered by an auxiliary 20 H. P. gasoline motor. Between 7 and 15 acres per day can be harvested, the speed depending upon whether the peanut vines are dry and brittle, or damp and tough.

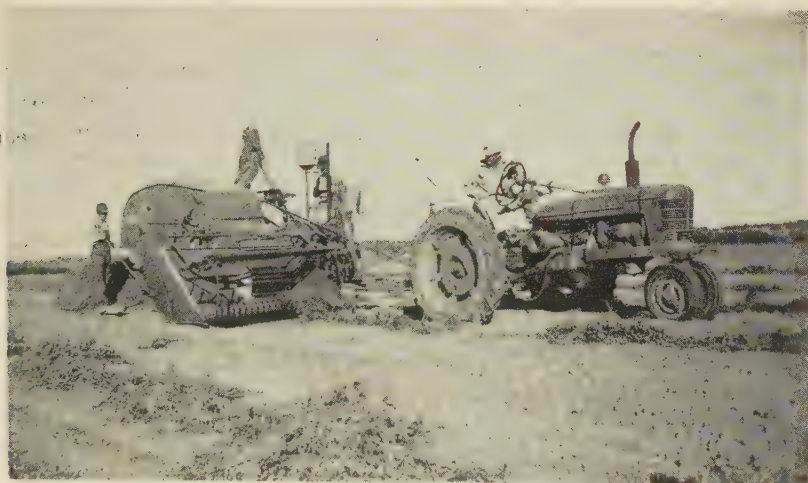


Figure 63. Peanut combine in operation at Stephenville station, threshing peanuts from a windrow and catching hay on a slide at the rear.

Inspection of Commercial Feed

The unprecedented demand for livestock and poultry feeds during the past four years has severely taxed the facilities of the Station in keeping the inspection service abreast of the movement of commercial feed.

During 1946, it is estimated that more than three million tons

of commercial feed were sold in the State for use in feeding range and farm livestock. This estimate is in line with the steady increase in the sale of commercial feed from year to year. From lots of feed found on the market, 3,297 official samples were secured for examination. Analyses revealed that many lots of feed found in trade channels were offered or sold in violation of one or more provisions of the Texas law. In all such cases appropriate action was taken to bring about correction.

In addition to administering the law, much time and effort is given to compiling and disseminating information on various subjects pertaining to feed. Manufacturers are given instructions in the proper method of formulating feed ingredients for general and special purposes in order that full utilization may be obtained, thus avoiding waste. Feeders are furnished data on composition of feed ingredients which assist them in selecting feeds most suitable for the purpose intended.

Salt Tolerance of Turkey Poults

Turkey poults show a definite lack of tolerance to salt. This manifests itself in low livability and low mean gains. Post-mortem examination shows hemorrhage and congestion in the gastrointestinal tract. A high percent of fluid in the body cavity has also been observed.

A salt-feeling experiment by the Station showed mortality of 38.4 percent in the 2 percent level of salt as compared with a maximum of 10 percent mortality in the 1 percent level. Mortality occurred between the 5th and 15th day of the experiment, and the poults on the 2 percent level drank a third more water than those on the 1 percent level.

It is concluded that, under normal conditions, a turkey starter ration having salt percentages of from 0.5 to 1 percent should not be detrimental to growth, or cause high mortality in broad breasted poults. If feeds rich in salt are used in the ration, or if salt water has to be used, the starter should contain not more than 0.5 percent salt.

Cotton for Mechanical Harvesting

Increasing interest in recent years in the mechanical harvesting of cotton in West Texas, particularly on the High Plains, has brought a demand for varieties of cotton that are more storm-proof and generally better suited to stripper-type machine harvesting than are the commercially-grown varieties.

Breeding experiments were begun several years ago at the Lubbock and Chillicothe stations to combine in synthetic hybrid types characteristics such as storm-proofness, a more determinate fruiting habit and earliness of maturity, combined with high yield of a quality of lint which will clean out well at the gin and possess good spinning properties.

Three promising hybrid strains, C. A. 89A, A. A. 122, and Storm-proof No. 1, were developed during 1945 and 1946 as a result of this work. Seed of these stocks have been released to State certified cotton seed breeders, who are increasing the seed supply to fill the demand for such cotton for planting in a large area in West Texas especially suited to mechanized production of cotton. During 1946 additional selections and new crosses were made to improve further the types of cotton being developed.

To hasten the breeding work, the Station greenhouse has been used during the past two winters for making initial and backcrosses, employing various combinations of varieties and strains, thus permitting the growing of two crops of cotton in one year. See Figure 64.



Figure 64. Storm-proof hybrid types of cotton being grown in the station greenhouse during the winter to hasten the breeding work of developing varieties of cotton for machine harvesting.

Fattening Lambs in the El Paso Valley

Heavy Rambouillet feeder lambs fed at the Ysleta station for 119 days on rations consisting of 74 percent alfalfa hay and 26 percent milo grain, graded 84 percent Choice, or AA.

Gains were as good for lambs fed 43 percent protein cottonseed cake as a supplement to alfalfa hay as for milo grain as a supplement, but the carcasses of the milo-fed lambs were higher in grade. First and fourth cutting alfalfa hay were of approximately equal value for lamb fattening. There was no indication of benefit from feeding bone meal as a lick. Except for a possible saving in labor, there was nothing to recommend the deferred feeding of grain.

The lots of lambs which were fed the larger amounts of either grain, cottonseed cake or a combination of grain and cake, made the larger gains. Standard, balanced rations were superior to unbalanced rations.

A Tomato for Northwest Texas

The long continued search for a tomato that will set fruit and produce a crop under the hot, dry atmospheric conditions which often prevail in Northwest Texas has at last been rewarded. The Red Cloud variety, of Nebraska origin, has given outstanding performance in trials at the Iowa Park station for the past two years.

Red Cloud is a hardy, early fruiting, small plant which bears smooth red fruits in large numbers. It is not uncommon for this tomato to produce from 20 to 30 good-sized fruits which are almost entirely free from splits and blemishes. Although it is supposed to be an early bearer which produces a crop and then is done, it will continue to produce successive crops until frost. In 1945, Red Cloud yielded from 2 to 3 times as much fruit as did some of the older standard varieties such as Earliana, Stokesdale and Pritchard.

Bounty, a similar tomato from the same source, is only a little less productive than Red Cloud and, by reason of its greater popularity in the Midwest, is already available through commercial seed channels.

Ascorbic Acid in Dehydrated Vegetables

Comparative tests were made by the Station on the effect of soaking peeled and sliced potatoes in antioxidants before steam blanching and dehydration. A mixture of 0.5 percent solutions of sodium bisulfite and sodium sulfite, adjusted to the same acidity as the juice of the raw potatoes, was slightly more effective in retaining the ascorbic acid content and the palatability of the dehydrated potatoes than either sodium bisulfite or thiourea solutions.

The greatest loss of ascorbic acid in cabbage, which had been steam blanched and dehydrated at 140°F, occurred during the first

hour of a total drying time of 4.5 hours. During the second hour of dehydration the rate of loss of ascorbic acid decreased noticeably. From the third hour until dehydration was completed the rate of loss was slight.

The immediate transfer of steam blanched sliced cabbage to the dehydrater, or rapid vacuum treatment, resulted in a greater retention of ascorbic acid in the dehydrated product than cooling it in running water after blanching. Cooling in cold tap water as compared with ice water made very little difference in the ascorbic acid content. Whether the vacuum was released with air or with carbon dioxide also made very little difference. Cooling the blanched cabbage in running water, followed by the vacuum treatment resulted in an increased loss of ascorbic acid as compared with the vacuum treatment alone.

The data indicated that rapid cooling to the temperature of the dehydrater after blanching is an important factor in the retention of ascorbic acid, and that cooling by some means other than with water is desirable.

How to Handle Kudzu

Kudzu is adapted to East Texas, but a proper appreciation of its limitations is essential for successful use. It is a good plant for gully control, Figure 65. However, it should not be planted in the raw sub-soil of the gully cuts. Rather, it should be planted in the top soil at the edges of the gully and the runners allowed to



Figure 65. Three-year-old kudzu on gullied area of watershed at the Tyler station.

grow down into the washes. By so doing, the runners will take root in the wash and eliminate soil erosion. Gullies carrying a large, or swift head of water will need additional treatment.

Kudzu may also be used as a pasture plant where proper precautions against overgrazing are observed. Livestock are very fond of kudzu and eat it in preference to other pasturage.

Possibilities for Soybean Production

Soybeans have not become established as an important crop in Texas in spite of the need for vegetable oils and high protein feed that has been aggravated by the reduction of the cotton crop during recent years.

It appears from trials at the Chillicothe station that the use of late-maturing varieties planted about June 15 offers a promise that soybeans may become a profitable crop in the northern part of the Red Prairie region, Figure 66. Such non-shattering varieties as Mamloxi, Mamotan, and Coker Selection will produce 800 to 900 pounds per acre of good quality beans that mature in October and can be harvested with a combine.



Figure 66. Showing growth of soybeans at the Chillicothe station.

Vitamin C in Turnip Greens

Turnip greens are a very popular vegetable among rural Texans and one of the most dependable sources of vitamin C in the diet. Homemakers differ greatly in the manner of cooking greens. Some discard part or all of the stems, others use them; some have a

generous amount of water for boiling, others very little; some cook a long time, others till just done. The effect of such differences on the content of vitamin C was determined by the Station in experiments with turnip greens.

Enough greens for four servings, nearly one pound, were used for each cooking. Some lots were cooked with about one quart of water, plenty to cover the greens while cooking. Other lots were cooked in one-third as much water, which was barely enough to cover the wilted greens. With both proportions of water, some lots were cooked until just done; other lots for twice that length of time. In all cookings the stems, cut off about one inch above the crown, were included with the leaf.

In the entire cooked product—boiled greens plus liquor—there was approximately three-fourths as much vitamin C as in the corresponding raw greens, regardless of proportion of water used or time cooked. When the larger amount of water was used, there was approximately twice as much vitamin C in the liquor, while the liquor from the smaller amount of water contained a little over one-half as much vitamin C as was in the greens. Stems, both raw and cooked, contained about one-half to two-thirds as much vitamin C as did the leaves from which they were cut.

Greens cooked in the larger proportion of water were milder in flavor and less bitter than those with the smaller amount of water. Each proportion of water produced greens preferred by some persons. The over-cooked greens were undesirable because they were very soft and mushy in texture, and less bright in color.

The greens alone, after cooking in the larger proportion of water, would have supplied one-third of the recommended daily adult allowance of vitamin C; those from the smaller proportion, two-thirds of the allowance. But both greens and liquor must be consumed to get the full vitamin C value.

Amino Acids for Poultry

Preliminary experiments carried out by the Station with poultry to devise rations deficient in certain amino acids but complete in other respects, show that with the young poult two amino acids, tryptophane and lysine, are definitely low in rations containing large amounts of corn.

These deficiencies are characterized by slow growth and also, in the case of a lysine deficiency, by the lack of normal color development in the feathers. In some of these tests, fish solubles were

added in order to assure adequate supplies of unidentified growth factors.

Data are also being obtained on the amino acid composition of poultry feeds, so that the protein components of the rations can be more adequately balanced in terms of the essential amino acids.

Effect of Trash on Grade of Cotton

Since mechanically-harvested cotton normally contains more trash, it is given a lower grade and receives a lower price than the same cotton when hand-picked. The suitability of our present cotton classing system, which was set up for hand-picked cotton with normal amounts of trash, to other harvesting methods, and the effect of the removal of trash on the grade, staple and price are being studied by the Station. Thus far, 136 cottons representing 2 regions and 4 methods of harvesting have been classed by a board of cotton examiners and a local classer using the same samples. All trash was removed, and the cottons again classed by the same classers. In addition to a composite grade, separate grades were given for leaf and color. Differences in grade, staple and price due to the removal of the trash were calculated.

The average percentages of trash removed and the resulting improvements in grade, according to the 2 classifications, were 6 percent, 3.6 and 2.1 grades for 64 hand-picked cottons; 8.6 percent, 4.7 and 2.3 grades for 9 machine-picked cottons; 9.2 percent, 4.4 and 2.3 grades for 26 snapped cottons; and 10.5 percent, 4.0 and 2.1 grades for 37 machine-stripped cottons. There was no significant change in the average staple due to cleaning. The averages for the 136 cottons were 8 percent waste, and improvements in grade of 2.2 and 4.0 for the two classers.

Differences between classers' grades were not reflected in the price differences, as the classers agreed on the grades of the uncleaned samples and there were small differences in price between the highest grades. Thus, by the two classifications, increases in price due to cleaning were approximately the same.

Assuming that cleaning changed the grade from LM+ to M+, which is the average for the 136 cottons according to one classification, the difference in price per pound was about 5 cents. With an average waste of 8 percent, 460 pounds of cleaned lint from 500 pounds would bring \$10 to \$12 more than the uncleaned lint, making no allowance for cost of cleaning and assuming present standards and price differentials.

Apicultural Research

Queen bees of three strains resistant to foulbrood, bred at the San Antonio laboratory (Figure 67), showed disease resistance of 90 percent, 95 percent and 95 percent, respectively, in an inoculation test.

Sixteen foulbrood-infested colonies of bees of five beekeepers, treated by the San Antonio laboratory with sulfathiazole in sugar syrup in 3 to 5 treatments, showed no trace of disease after 24 to 38 days from initial treatment, and remained free of disease for the remainder of the brood-rearing season. Five additional diseased colonies given disease-resistant queens, two feedings of sulfathiazole and placed under laboratory observation, showed no trace of disease during the remainder of the season.

Sweet clover grown for seed in four fields in Caldwell county was observed for pollination by honey bees. These fields had 200, 80, 14 and 35 acres respectively. The first was one mile distant from the bee colonies, while the other three were each $1\frac{1}{2}$ miles distant. Average number of colonies of bees per acre was .42, .80, 4.5 and 1.60, respectively. In the same order, the yield in pounds of seed per acre was 205, 186, 405 and 341.



Figure 67. Station out-apiary containing strains of bees resistant to foulbrood and colonies which recovered from the disease following treatment with sulfathiazole.

Skin Folds in Sheep

Skin folds in range sheep are being discriminated against to such a degree that sheepmen are anxious to know how they may be eliminated. Some are doing this by crossing to a smooth, non-fine wool breed. While this is effective so far as the skin folds are concerned, it has serious consequences to the wool produced in succeeding generations.

Genetic analyses of both purebred Rambouillets and crossbreds at the Sonora station indicate high heritability and dominance of a few pairs of genes for lack of skin folds. These results show that skin folds may be easily reduced to a low point by selection alone. Two lines, one selected for smoothness and the other for intermediate type, are now in process of formation and comparison.

Bluestem Meadows in East Texas

Little bluestem has been successfully established and used for hay on East Texas upland soils of the Bowie and Boswell (Kirvin) series. The use of clean seed at 10 pounds per acre has not been a very satisfactory method of establishing a stand.

Good results have been obtained at the Tyler station by use of unthreshed seed material. By this method, the area is first planted to oats, then overseeded with the unthreshed bluestem when the latter is mature, Figure 68. The first cutting of hay is usually



Figure 68. Little bluestem meadow on top of oats in 1939. It has been cut twice each year since 1942 with an average annual yield of $2\frac{1}{4}$ tons per acre. An occasional seed crop is obtained after the second cutting.

ready in 18 to 20 months after seeding, and in the meantime a crop of oats will have been harvested.

The use of legumes in combination with established bluestem has resulted in an increase in yield of hay, both in the cutting of which the legume is a part, and in the cutting following the maturity of the legume. Narrow leaf vetch (*Vicia angustifolia*) and low hop clover (*Trifolium procumbens*) have been the best suited for this use.

Improved Pastures in the Gulf Coast Prairie

Twelve cross-bred heifers, three-fourths Hereford and one-fourth Brahman, averaging 466 pounds in March, 1945 at the Angleton station, weighed 1,023 pounds in November, 1946. They were grazed continuously on 40 acres which had been plowed, disked, drained, seeded, phosphated (100 pounds phosphoric acid per acre disked into the soil) and mowed for the control of weeds, Figure 69. A similar group of heifers grazed continuously on 40 acres of native pasturage averaged 821 pounds in November, 1946. This group of heifers had 239 pounds of concentrates per head during the winter of 1945-46 in addition to prairie hay. The heifers on improved pasture had prairie hay only, but wintered in much stronger condition.

Heifers on pastures given single or combination treatments of mowing, leveling and seeding had no advantage over heifers on



Figure 69. After 14 months grazing on phosphated pasturage, these heifers had a big advantage in size and condition over similar heifers grazing native pasturage.

native pasture. Heifers on plowed and seeded pasture and on phosphated and seeded but unplowed pasture had marked advantage over the heifers on native pasture, but were inferior to those on the pasture which had complete improvement.

It is evident that big cows can be developed on phosphated pastures; also that cattle can be wintered in strong flesh on such pastures without feeding concentrates such as cottonseed cake.

Peaches for the West Cross Timbers

Peach production in the West Cross Timbers region has been hampered by a lack of standardization of varieties among the hundreds of small growers who market fruit in this area.

An extensive variety test at the Stephenville station indicates that a succession of ripe fruit may be harvested throughout the season even by limiting the planting to about four reliable yellow-fleshed varieties such as Redhaven, Halehaven, Elberta and Frank.

Range Equipment for Turkeys

Handling turkeys on the range during hot summer months and during inclement weather of the fall months results in a wide variety of demands for managerial aids. Use of several types of portable shelters, roosts, feeders and water devices at the Station poultry farm permits the recommendation for a practical, yet economical roost, shelter and feeder combination. See Figure 70.

The advantage of this combination unit is that it answers the range demands for mobility, shade, shelter, feed space and roost space for 75 growing turkeys from three months of age to maturity. The unit is built on 4 x 4-inch creosoted runners. The galvanized roof answers the need for shade and dropping board. Droppings should be removed often enough to allow drying, thereby reducing fly breeding. The roof affords protection from rain both to the birds and to the feed. Because of the galvanized roof, the need for costly covers for the feed hoppers is eliminated.

Outlying Stations Serve the Public

Farmers, ranchmen, agricultural workers and students in agriculture in ever increasing numbers are visiting the substations and field laboratories of the station system, Figure 71.

These visitors get information on their own problems from the personnel of the field stations. Research in progress is demon-

Figure 70. A sunbathing cage shelter, roof and feeder for 75 turkeys.



strated and explained. First-hand knowledge thus gained is invaluable to these groups in keeping abreast of better agricultural practices.

Many of the substations hold one or more field days each year with from 500 to 2000 farmers and ranchmen in attendance. General reviews are given of experiments under way at that station. Each talk is followed by a questions and answers period in which specific information is given on all kinds of agricultural problems.



Figure 71. A group of Coryell county farmers receiving first-hand information from the personnel of the Temple station.

Roup Takes Heavy Toll

Roup is a costly disease to Texas poultry owners, Figure 72. It is caused by *Pasteurella* organisms, and not by dampness, faulty ventilation or bad feed, as has been reported. The disease causes many deaths, staggers growth of young birds, and disrupts egg production to the extent where it is not profitable to keep such infected flocks. The same germ is also responsible for types of sinusitis of turkeys. Recovered birds remain carriers of the disease and can transmit it to susceptible birds of any age.

This disease is easily prevented by not allowing susceptible pullets to come in contact with old birds that may be carriers. There are no proved remedies to prevent or treat this disease. Recent experiments by the Station with some of the sulfa drugs did not give very encouraging results.



Figure 72. Front and side view of chicken with roup. Notice left eye lids stuck together.

Madrid Sweet Clover for the Blacklands

Performance of Madrid sweet clover at the Temple station during 1945 and 1946 indicates it has a definite place in the agriculture of the central Blacklands, even though it is susceptible to root rot. An early October seeding in 1945 began blooming in May and was still flowering in November, 1946. It remained green and vigorous during the entire season. Very little of this fall seeding died from root rot, whereas approximately 75 percent of a spring planting was killed by root rot.

Madrid sweet clover has several outstanding characteristics which make it a good plant for the central Blacklands. It acts as an annual when fall seeded; it has a very large and extensive root system; it is a good forage plant; and it stays green during the summer. Additional experimental work has been started to study ways of using this fine sweet clover in cropping systems for the central Blacklands. See Figure 73.

Disease-resistant Potatoes

Each year hundreds of different hybrids and selections of potatoes are supplied the Weslaco station by scientists of the U. S. Department of Agriculture. A number of these selections have shown a high degree of resistance to diseases such as late blight and scab, and yields of marketable tubers have been exceptionally high.



Figure 73. Comparative growth of Madrid sweet clover, common white sweet clover and hubam sweet clover. Seedings were made October 3, 1945; picture was taken April 4, 1946.

Sebago is the outstanding named variety which has been developed under this potato-improvement program.

Tomato Yield Depressed by Ammonia

Soil applications of liquid ammonia at the Weslaco station to supply 100 pounds of nitrogen per acre, when applied 30 days prior to planting, had a depressing effect on the yield of some varieties of tomatoes which normally produce exceptionally heavy vines.

This is in line with previous results, which indicate that it is not advisable to use sulphate of ammonia or ammonium nitrate in fertilizing varieties such as Rutgers and Marglobe, when grown on sandy loam soils of the Lower Rio Grande Valley.

Weak-vined varieties, such as Valiant and Grothen's Globe, were benefited by the ammonia treatment.

Sorghum Being Developed for South Texas

Foliage disease is a big factor in the production of grain sorghums in the humid portion of the coastal area and the Lower Rio Grande Valley. Selections from crosses made with Shallu and several of the standard varieties at the Weslaco station show marked resistance to foliage disease and high yielding ability.

Further inbreeding and selection will be needed to fix the type in these selections.

Cooperating Agencies

Several of the research projects mentioned in this report have been carried in cooperation with representatives of various bureaus of the U. S. Department of Agriculture and other agencies of the Federal Government. Other work is done with the cooperation of the Extension Service and the School of Agriculture of the Agricultural and Mechanical College of Texas, on grants of funds from private business and associations, and in the field with the assistance of individual ranchmen and farmers. This cooperation is acknowledged with appreciation and encouragement for its continuation on even larger scale.

